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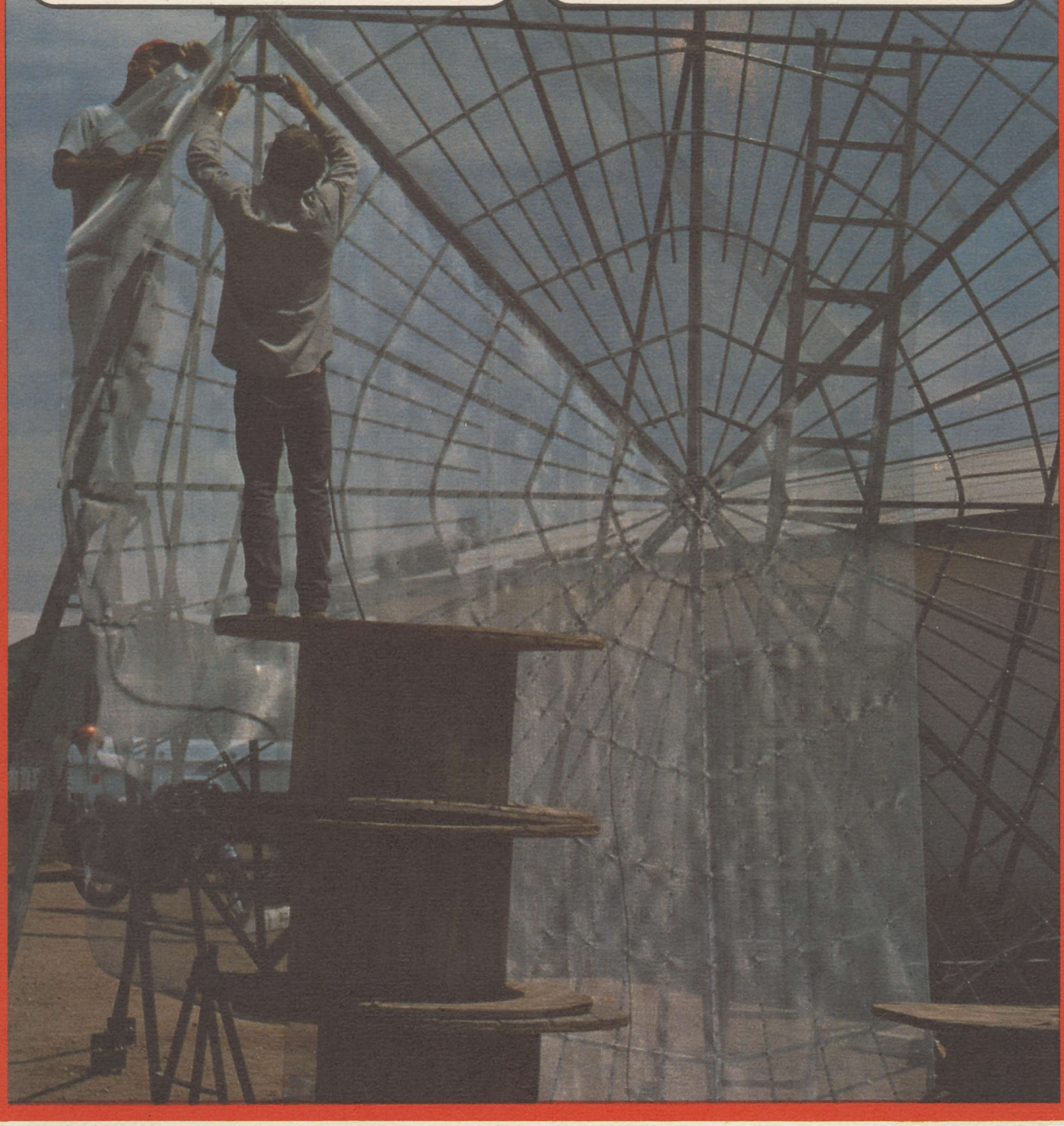
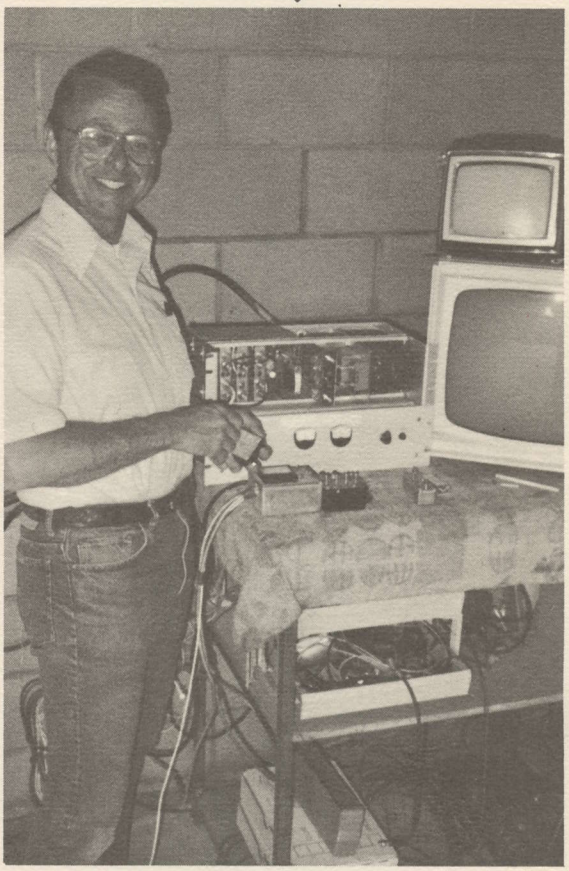
COOP'S SATELLITE DIGEST

NOVEMBER 1979



INTRODUCING....

MR. CHEAP



MR. CLEAN

Robert M. Coleman of Travelers Rest, S.C. has been dubbed 'Mr. Cheap' because his approach to designing and building low-cost TVRO terminals is bottom line slanted. H. Taylor Howard of Stanford University, on the other hand, wants every electron in place and every cable harnessed. So we call him 'Mr. Clean'.

The Howard Terminal produces perfect pictures. Featuring a Howard designed and tested bi-polar LNA package, a Howard conceived fully frequency-agile 24 channel tuneable receiver (with selectable audio sub-carriers) the **HOWARD TERMINAL MANUAL** leads you gently from the reflector surface (which you provide) through the horn-feed (described by Howard) through the multi-stage LNA and then through a complete build-it-yourself professional grade receiver. Less the parabolic reflector, you can duplicate the Howard Terminal receiving package using state-of-the-art brand new parts for less than $1,000.

The Coleman Terminal produces high quality pictures; but not perfect. The original Coleman Terminal produced satellite television for around $200 of Coleman's money. You start out with 'surplus' (as in used) equipment, modify it slightly, plug it all together and you are in the satellite TV reception business. The **COLEMAN TERMINAL MANUAL** shows you how, step by step, including constructing your ultra-low-noise GaAs-FET TVRO LNA! With 'the Coleman approach' you start off for small change and improve your system step by step as your desire and finances dictate.

The HOWARD TERMINAL MANUAL is priced at $30 from STT. The COLEMAN TERMINAL MANUAL is also priced at $30. **And** - you can have both manuals, together, as the perfect complimentary package of the 'cheap' and 'the clean' approaches to low cost satellite TV reception for the special STT package price of $50 (in U.S. and Canada; outside add $5 **per manual** for airmail service).

SATELLITE TELEVISION TECHNOLOGY
P.O. BOX G
ARCADIA, OK 73007 (405-396-2574)

COOP'S COMMENT ON TECHNOLOGY

FCC DOES IT!

On October 18th in a 25 minute session the Federal Communications Commission in a unaminous vote determined that from this point forward anyone installing a satellite (television, audio, etc.) **receive** (only) terminal should have the option of either (1) getting it licensed, or, (2) **not** getting it licensed. The decision creates a framework for the immediate growth of satellite television reception services.

The impact of the decision may be several months in coming however. The Commission directed the staff to work out the procedures for "registering" satellite receive-only terminals; the registration procedure will be the process installers will follow if they 'opt' not to go through the full licensing routine. Just what information will be required in the registration process, when you will register, and what rights (if indeed any) go with a 'registered terminal' all remains to be worked out by the staff. One would expect this process to take a minimum of 30 days and more likely 60 to 90 days before all of the puzzle pieces are in place.

CSD reader and satellite enthusiast **Paul Fox**, who lives in the Washington, D.C. area, attended the FCC session and was extremely fortunate to arrange for a videotaping of the historic meeting. After Coop has received the videotape of the meeting and has carefully reviewed everything said by the Commissioners and staff, we'll have a more detailed report (in the December issue of CSD). Those with terminals up and running can look forward to seeing this videotape on Coop's SATELLITE MAGAZINE program sometime in December.

Does this mean that **anyone** can now install a terminal, on their own, **and start tuning in programming** from various satellites at will; without jeopardy from 'the law? Not yet. It simply means that you are, under this decision, no longer required to go through the FCC licensing procedure to **build** a terminal. **Operating the terminal** is still a different can of worms. Operating the terminal means that you watch what you receive. And to watch what you see, or can tune in, you still must have the written authority of the programming source on the bird(s). The subject of which program sources will and will not deal with you, on a private terminal basis, was discussed in some detail in the Programming Section of CSD in October. The facts remain the same; some (about 80%) of the program sources **will** authorize you to watch their programs. Some do it gratis, some want a fee and a few want big fees. Previous to the FCC decision the bird common carriers were precluded from authorizing you to watch their programs **until** you could prove you had an FCC license to build the receive-only terminal. Now with the FCC decision, you no longer need to prove that you have FCC authority although it **may be** necessary to prove tht you have 'registered' the terminal before they will grant you that authority. All of that should sort out in the next 30 to 90 days and we'll keep you advised here.

Just as soon as we think we know what format the registration process will take, CSD will publish a form for you to complete in registering your own terminal. In the interim, sit tight. Breathe a sigh of relief that the big hurdle is now past. And start thinking about all of that good satellite video you will soon be enjoying; legally!

NEXT UP

By its action, the FCC in effect gives the green light to numerous large, competitive, manufacturers who have been studying the satellite TV hardware field that **now** it is OK to jump in with both feet. We can expect, in the next six months, to see numerous firms with big wallets and great capabilities entering the satellite hardware field. This will increase the competitive nature of the hardware pricing, bring about innovative new terminal designs, and greatly increase the awareness of the man in the street that there is indeed something called satellite television.

For those firms already in this field, vertical integration is now taking place. Cliff Gardiner's firm, Gardiner Communication Corporation, in Houston, Texas has recently gone from being a pure distributor of hardware (buying component hardware parts from firms such as Microdyne, AFC, SCI, etc.) to the posture of manufacturer. Cliff has done this by [1]purchasing a relatively small parabolic antenna manufacturer in Florida called Green Associates (they have a five meter fiberglass antenna), [2]negotiating on a royalty basis production rights for the Swan line of Spherical antennas (see story in Programming Section this issue), and [3] agreeing to purchase the satellite electronics portion of Scientific Communications, Inc. (SCI). The last 'deal' is the most significant one since SCI's line of LNAs and satellite (video and audio) receivers will become part of Cliff's Houston production operation.

This places Gardiner in a position to deal effectively with the full service offering of Scientific Atlanta, for example, where virtually everything that goes into a terminal is produced 'in house'. It also gives Gardiner a way to better control his own contract terminal installations; depending upon outside suppliers such as Microdyne and AFC, who themselves sell 'turnkey systems' direct, for hardware has been tricky at best since anyone who sells direct is always going to take care of their own direct customers first. And if the direct customers eat up the full production capabilities, that leaves a distributor such as Gardiner in a tough spot.

We wish Cliff well with his much larger operation. The competition he will bring into the marketplace will be good for us all.

CSD TECHNOLOGY

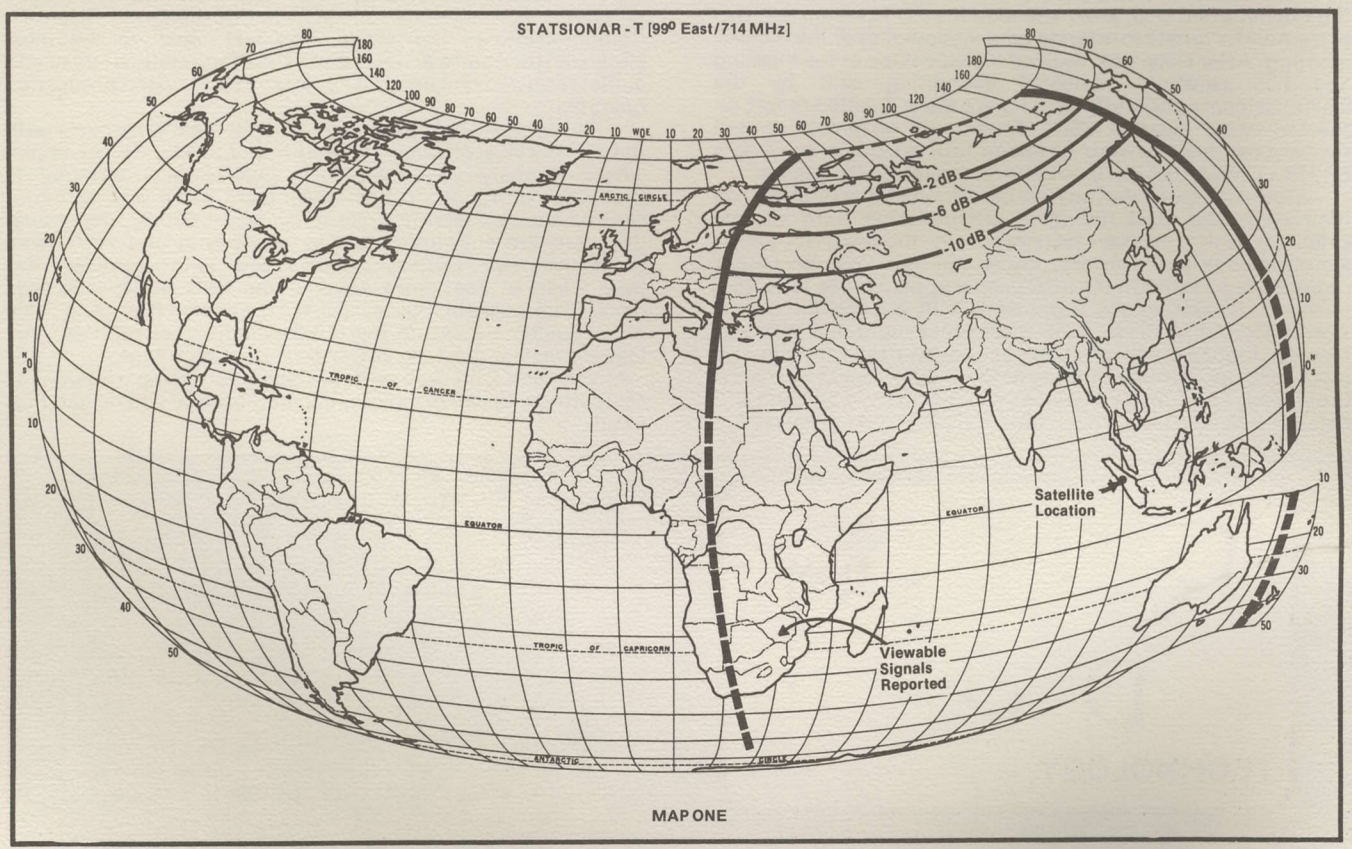
COOP'S SATELLITE DIGEST (Technology Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Technology and Programming) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing.

RUSSIA'S GLOBE CIRCLING 4GHz SATELLITES

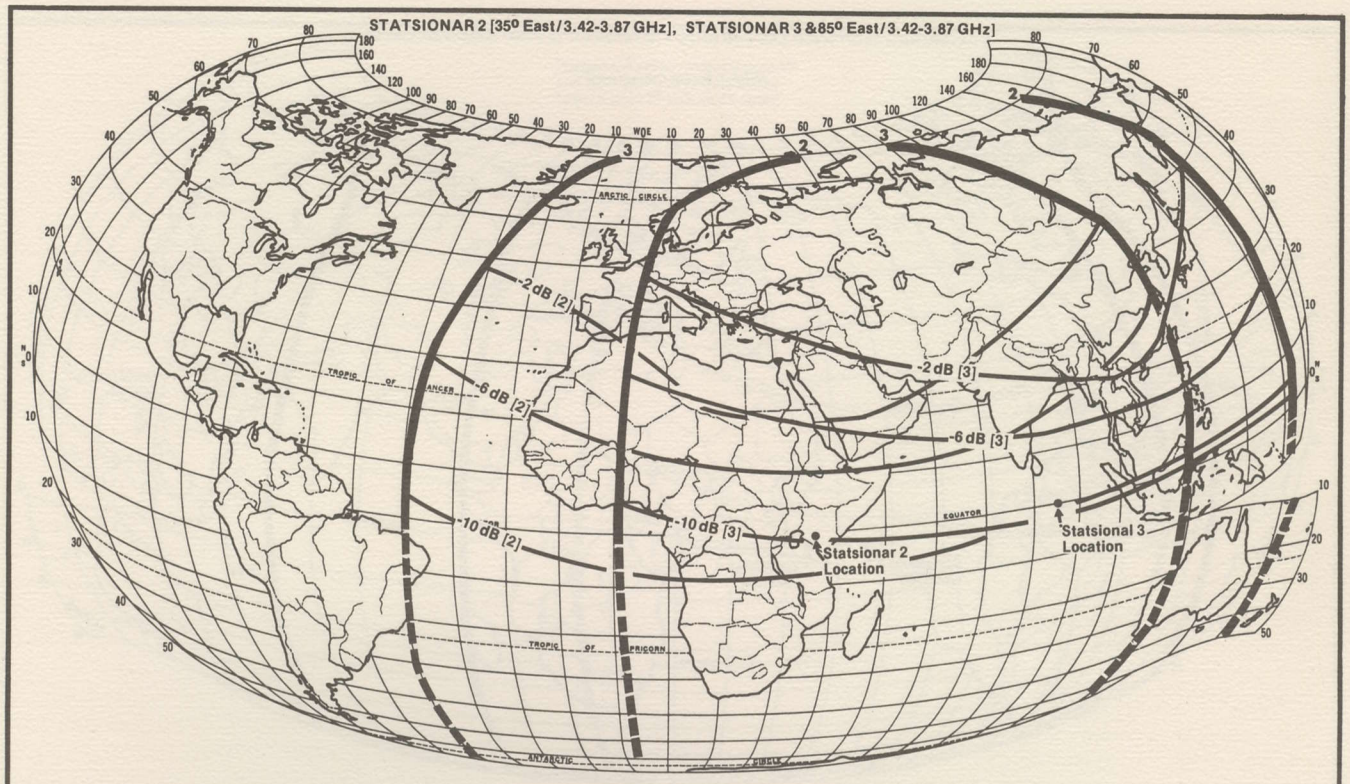
A CONGESTED ORBIT BELT

The final results of the current World Administrative Radio Conference (WARC) not to the contrary, a battle for supremacy in the geostationary orbit belt is beginning to shape up as the 'skylanes' fill up to near capacity in some portions of the world; in the 4 GHz downlink or C band service. Not to be outdone by INTELSAT (the international consortium owning and operating transponders for hire) nor to be outdone by the U.S. efforts to place American designed and constructed satellites into key orbit positions for regional and domestic service (before the orbit belt fills up), the Russians have been quietly but steadily involved in a massive world-girdling program to bring Russian originated television and communications to virtually any point on the globe. There is some considerable potential for conflict here, between Russian C band birds and those now operating or planned by INTELSAT and even some domestic systems. Here is what it is all about.

In 1976 the Russians began construction on a geostationary satellite system. Prior Russian systems had largely been employing the inclined orbit approach (see **CATJ** for January 1979, pages 38 to 40-A). Inclined orbit (Russian) birds have an apogee of around 40,000 kilometers and a perigee of only 540 kilometers. During apogee the bird hangs in a '**almost** stationary position' for a period of about 8 hours length, then the bird rapidly sweeps down towards perigee and returns to the apogee area some 4 hours later. The birds are in an inclined orbit of approximately 63.5 degrees in this motion. This system suits many Russian needs better than a true geostationary orbit because the combination of the inclined orbit plus the apogee height allows the birds to 'see' **over the top** of the North Pole (geostationary birds are cut off from visibility for any area north of approximately 80 degrees) and in fact down the opposite 'side'. Direct relay from Moscow to Cuba in 'one hop' is for example practical with this system.



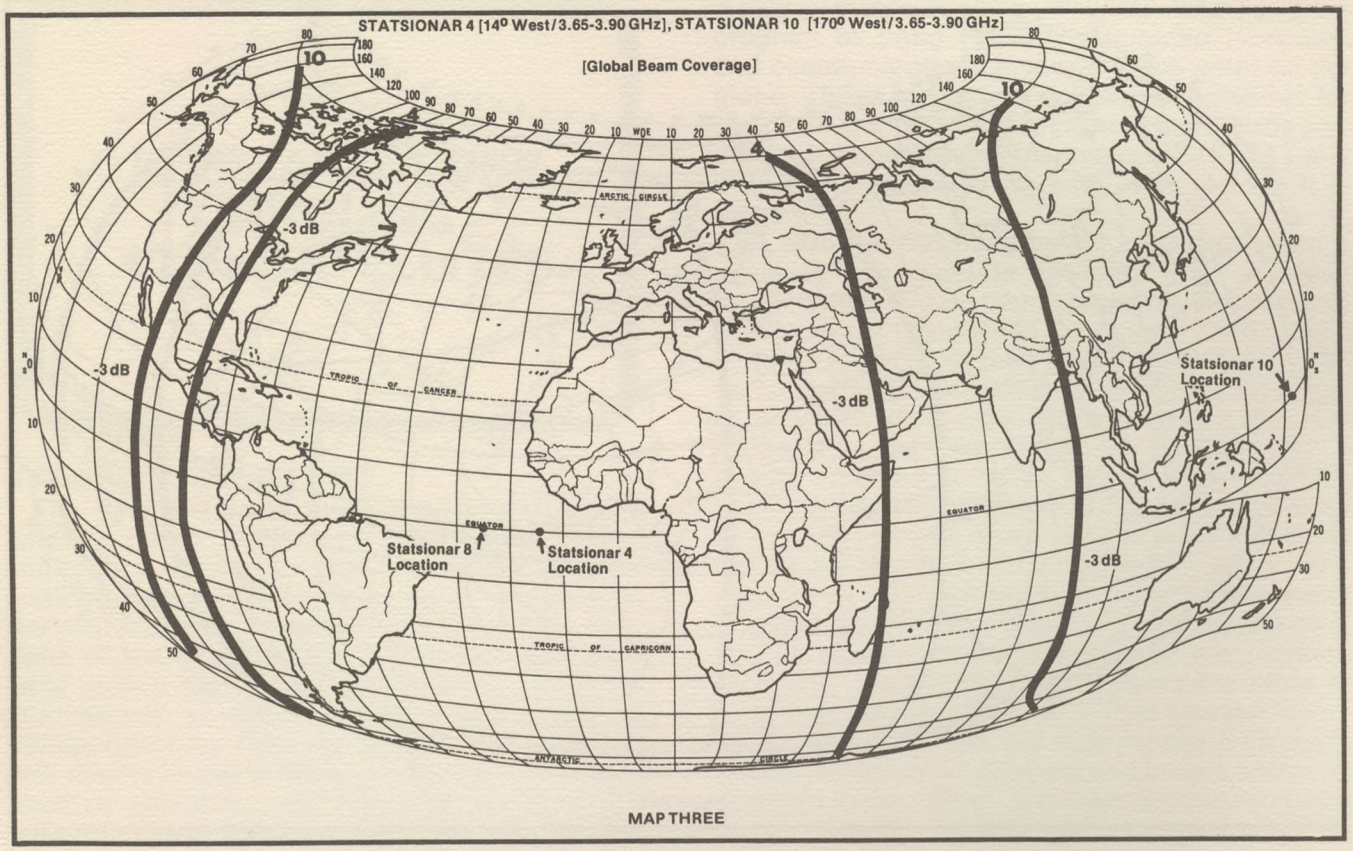
MAP ONE



MAP TWO

The Russian entry into the geostationary world began with orbit slots picked over the Indian Ocean. Statsionar T, located at 99 degrees east (see map number one) is actually a UHF (downlink band) bird with a center frequency of 714 MHz. With a 200 watt (output) transponder and a 90 element helical antenna the system has an EIRP of 56.5 dBw at boresight. Some indication of the antenna pattern can be seen in map number one. There is some reason however to believe that the antenna pattern may not be nearly as well defined as the Russians indicate on this map; Rhodesian experimenters report reception of a viewable nature even though they would be (by extrapolation) at least 20 dB down from the boresight center of the pattern. A receiving terminal located in the far western portions of Alaska would be within range (i.e. the bird would be above the horizon). Anchorage has a horizon cut off of 139 degrees east; Honolulu loses its horizon to the west at 122 degrees east. At other (reader) locations, such as Papua, New Guinea the Statsionar T bird would be 34 degrees above the horizon. The Russian receiving systems operating with Statsionar T are typically rooftop yagi (linear polarized although the bird transmits circular and a circular or helix receiving antenna would gain 3 more dB) and simply UHF or VHF downconverters. The intended and regular use of this service is to provide direct Moscow television to the area east of the Ural mountains, and on into Siberia.

So far there is no 'conflict' with the worldwide explosion in C band (4 GHz) geostationary satellites. Next up however was the Statsionar-2 bird which is located at 35 degrees east and Statsionar-3 located at 85 degrees east. This particular Russian satellite family is reported to have an EIRP of 29 dBw in a (northern) hemispheric beam in the (roughly) 3.4 to 3.9 GHz region. Note that INTELSAT and other (including U.S.) domestic system birds operate in the 3.7 to 4.2 GHz downlink region; and that the Russian birds 'share' a 200 MHz portion of the otherwise common spectrum between 3.7 and 3.9 GHz. Statsionar-2 is intended to provide radio, telephone, telegrams and video between the European portions of Russia and the western USSR. Statsionar-3 has similar capacity except that it has a secondary purpose of providing Moscow television to the Kamchatka peninsula just north of Japan. (Note that some sources place Statsionar-3 at 80 degrees east rather than the 85 degrees noted here; Russian released coverage maps for 2 and 3 appear here.) The 85 (or 80) east location of 3 is still not of much interest to North American based receive terminals since it is 'over the horizon' for anyplace in North America. The 35 degree east location is just beyond the horizon for many of



MAP THREE

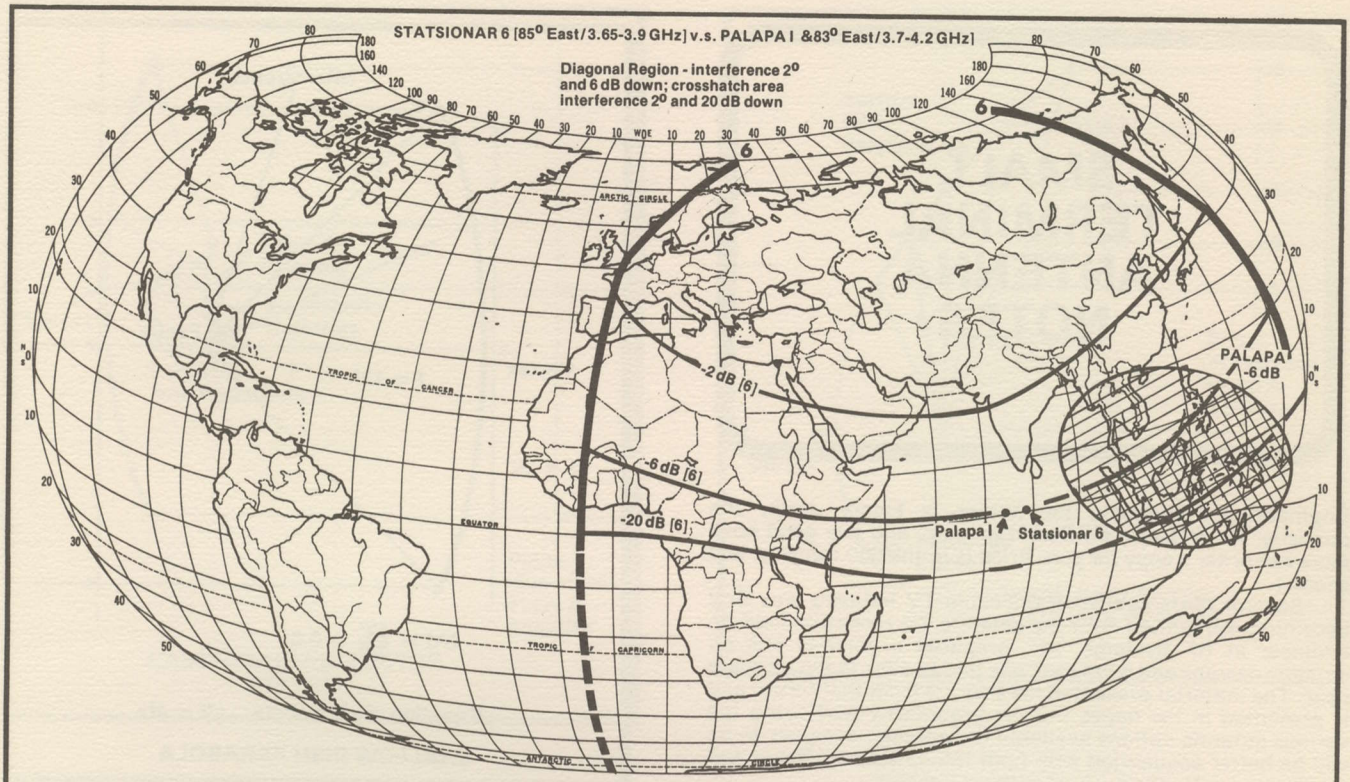
the more eastern North American locations (the horizon stops at a geostationary orbit position of 14 degrees east for Bermuda, Caracas, and San Juan; at 17 degrees east for Sydney, Nova Scotia). But the Russians have more birds on the drawing boards and some of these will be much closer to North America.

When the Statsionar series is finished by 1981, the Russians plan to have 9 operating satellites in geostationary orbit. Statsionar 4 through 10 will be operating more or less in the 4 GHz band while Loutch 1-4 will be the first 14 GHz uplink and 11 GHz downlink birds of Russian design. Note in table one that the Russian uplinks and downlinks (where specified precisely) vary considerably from bird to bird or area to area; the Russian 'technique' for squeezing in their own satellites in geostationary orbit positions where normalized operation in the 3.7 to 4.2 downlink band would create potential interference for existing INTELSAT and/or domestic satellites.

Also keep in mind that any satellite designer has the option of providing (1) global coverage (i.e. the bird's transmit antennas "see" approximately 40% of the earth, in all directions simultaneously, as far as the horizon), (2) hemispheric coverage (typically in INTELSAT hemispheric coverage is defined as 'north' or 'south' although in theory it could also be 'east' or 'west'; think of hemispheric coverage as a portion or chunk of the global coverage possible), and, (3) 'shaped beam' coverage such as our own domestic satellites provide. Much of the INTELSAT operation is in the hemispheric mode although by ground commands the satellites can be switched to global or 'shaped/spot beam' coverage at will.

Of primary interest to North and South American area viewers will be the operation of **Statsionar-4 at 14 degrees west** (above the horizon as far **west** as a line drawn north and south between Chicago and New Orleans) and **Statsionar-10 at 170 degrees west** (above the horizon as far **east** as a line drawn between Billings and El Paso. Both of these birds will be operating with Global patterns and if indeed the power level is in the 29 dBw region locations such as Miami (Statsionar-4 will be 14 degrees up), Boston (Statsionar-4 will be 15 degrees up), Los Angeles (Statsionar-10 will be 23 degrees up) and Anchorage (where 10 will be 19 degrees above the horizon) all look 'do-able.' Note that Russian sources indicate both 4 and 10 will be operating in the 3.65 to 3.9 GHz downlink region. Statsionar-4 is scheduled to be up at about the time you read this; 10 is not due up until mid-1980.

There is yet another Statsionar bird of interest; particularly to the eastern two-thirds of the North American region. That is bird number 8 which is



MAP FOUR

scheduled for a 1980 launch to an orbit position of 25 degrees west. Officially, Statsionar-8 is a standby or reserve bird for Statsionar-4. However by being another 11 degrees further to the west, it moves the possible reception zone well into the mid-lands of the U.S.A. and Canada. For example, in Chicago the 4 elevation is but 3 degrees while 8 will be 12 degrees up. Houston loses out on 4 but will find 8 a manageable 8 degrees above the horizon. Winnipeg also loses on 4 but could scrape by with 8 at a 3 degree elevation (if the system installer was careful to shroud against terrestrial noise!). Toronto will find 8 a big 17 degrees up, Kansas City will find it at 7 degrees elevation and back in Miami the shift to 8 brings Statsionar 8 in at 23 degrees above the horizon.

Statsionar-6 is another interesting bird even if it is out of reach except for the Pacific Islands; at 85 degrees east. The transmitting downlink in the 3.65 to 3.90 GHz region (the bird is scheduled for life in mid-1980) will be fed into a **pair** of antennas; one shaped for most of Europe, the western part of the USSR and the northern portion of the middle east. The second downlink transmit antenna will be shaped for the northern half of Africa as well as the bulk of the USSR. The **uplink** system (6.0 to 6.25 GHz) will employ non-directional **receiving** antenna arrays so that in fact it is a 'global pattern' uplink system. Input signals can access the bird from as far west as central Africa, as far east as Australia, and from 80 degrees north to 80 degrees south. The Russians, in print, have taken note of the presence of the Indonesian Palapa series satellites; Palapa I is positioned at **83** degrees east. The Palapa system is using a shaped or spot beam approach designed to cover the Pacific Basin countries in a circle roughly 2000 miles in radius centered on Jakarta. The two degree separation between the two birds should present no real problems for the **downlink** users since the Statsionar-6 bird will be boresighting on Europe and Asia while Palapa is looking almost directly down. The uplinks may however conflict and for the most part it is likely to be the Russian bird that suffers with the omni-directional uplink receiving antenna pattern that is global coverage in design. The Russians have been quoted as saying "mutual interference cannot be avoided".

ANTENNA COMPARISONS

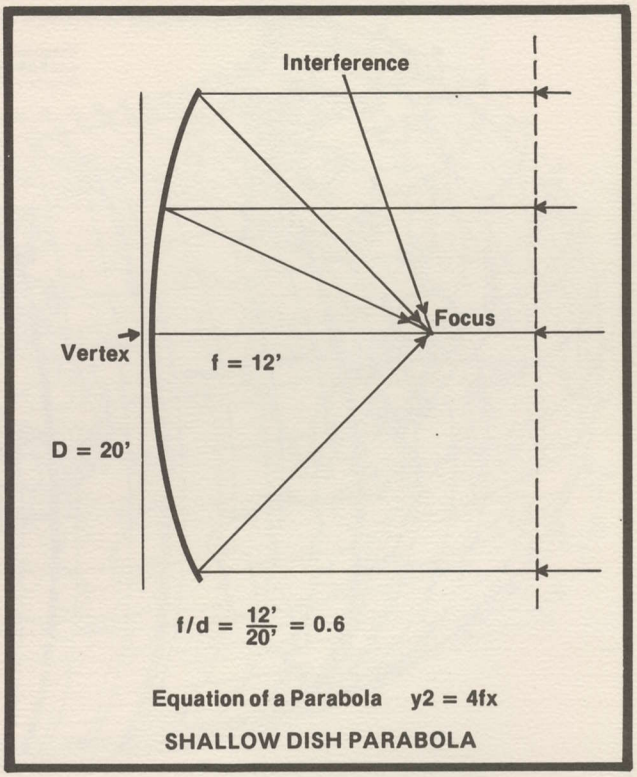
As this issue's story on the Oliver Swan Spherical TVRO antenna status notes, there are several approaches to effective TVRO antenna design available to the designer/builder. The Swan Spherical is of course the newest of these techniques. Older techniques, in use for several decades in one form or another, are more 'classical' in design coming as they often do straight from the antenna textbooks. (**Note** - Perhaps the most useful antenna textbook around is appropriately titled **Antenna**

SMALL TERMINAL ANTENNA NOTES

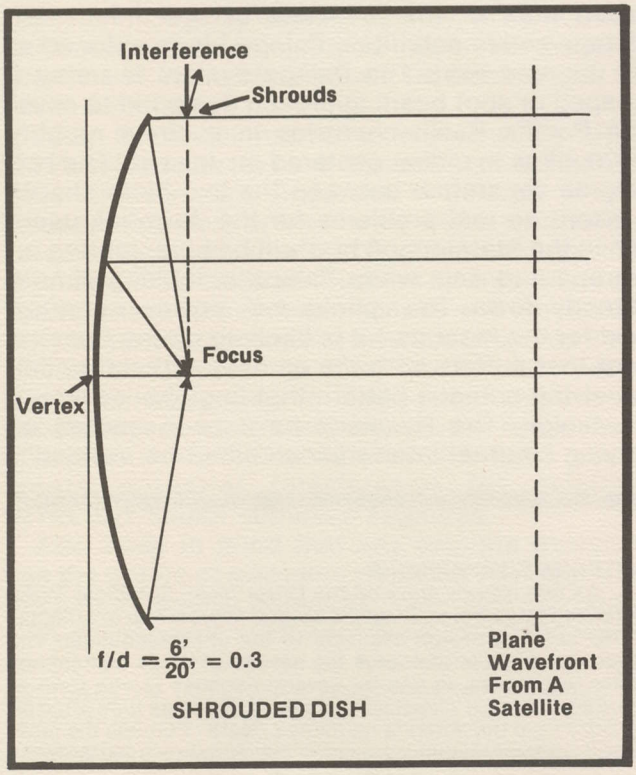
Engineering Handbook; the author is Henry Jasik, the publisher is McGraw-Hill Book Company and any good book store can order a copy for you. Price is in the $30 range at last check.)

Several years ago when the cable TV industry was first becoming acquainted with the satellite TV reception field an engineer at RF Systems, Inc. prepared a detailed talk on antenna designs and what each one had to offer to the ultimate user. The material presented here comes from that forum and is presented in the hopes that by graphically portraying the various antenna options available the antenna designer-to-be will be better acquainted with both the options available and the design trade offs involved with each option.

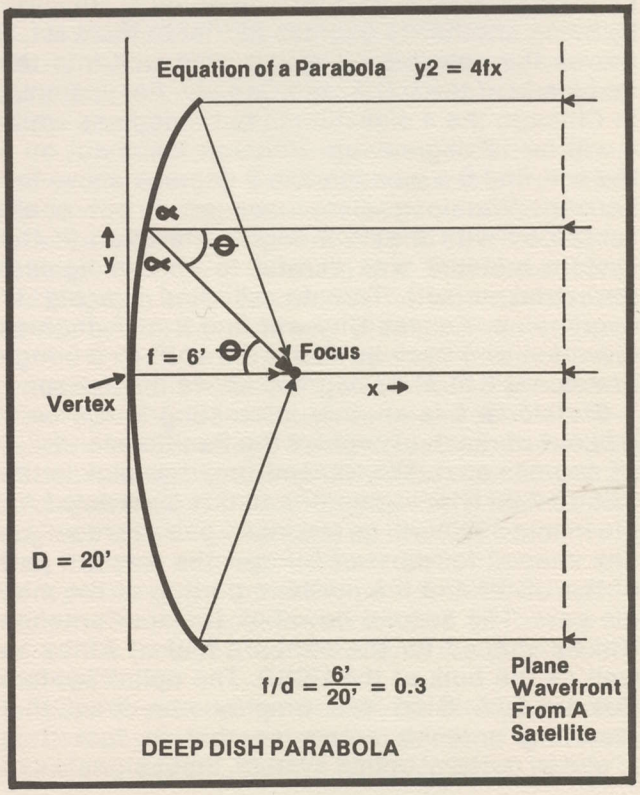
For those who do not have the 'luxury' of designing the antenna surface from scratch, but must work with someone else's design by virtue of having located a 'surplus' antenna reflector surface, the material appearing here in box form should be useful. Given two knowns (the antenna Radius, and the physical depth of the antenna) you can then proceed to calculate the f/d of the particular antenna you have located.



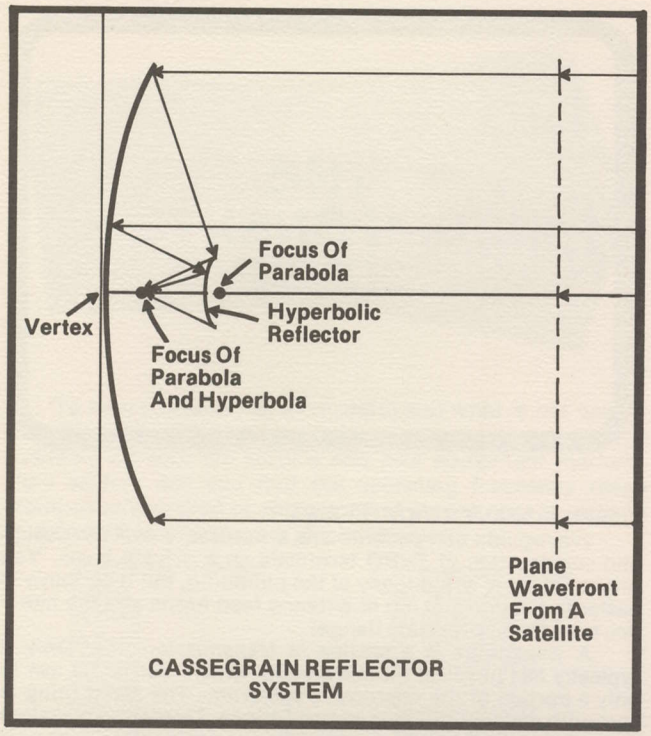
SHALLOW DISH PARABOLA



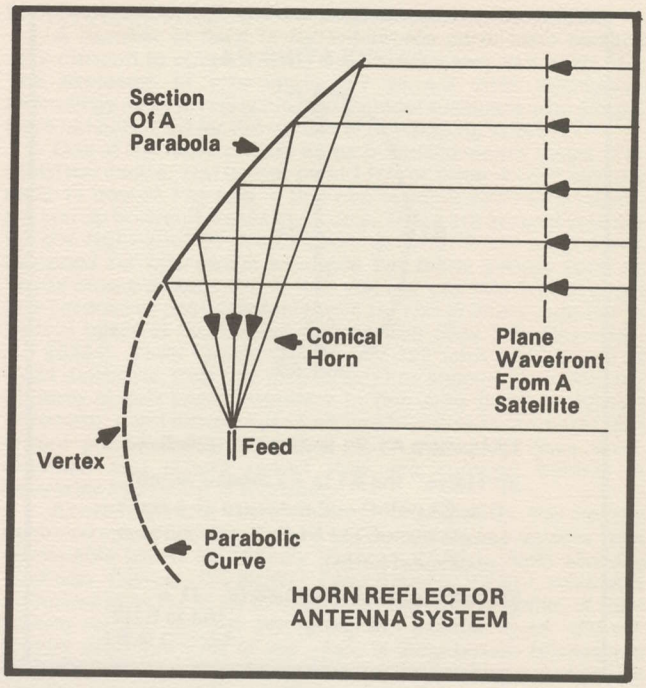
SHROUDED DISH



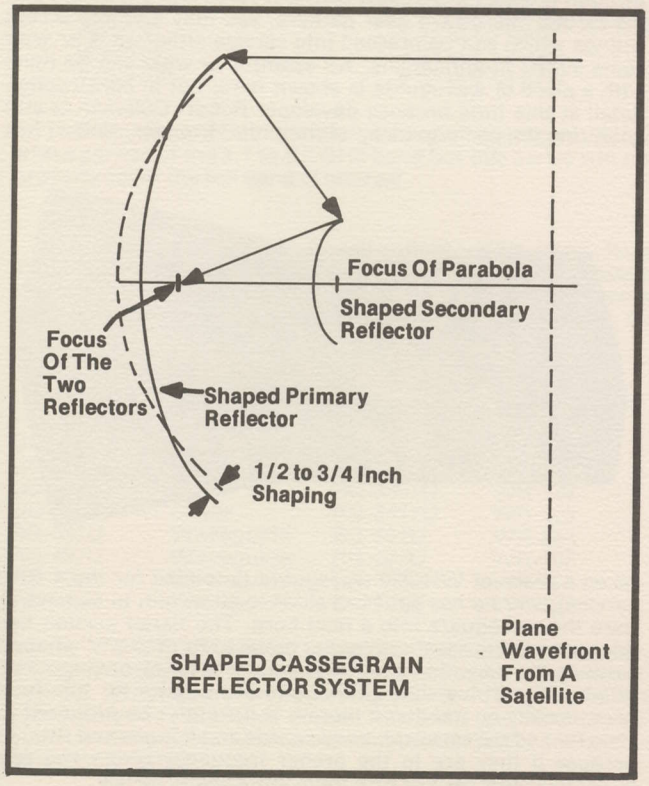
DEEP DISH PARABOLA



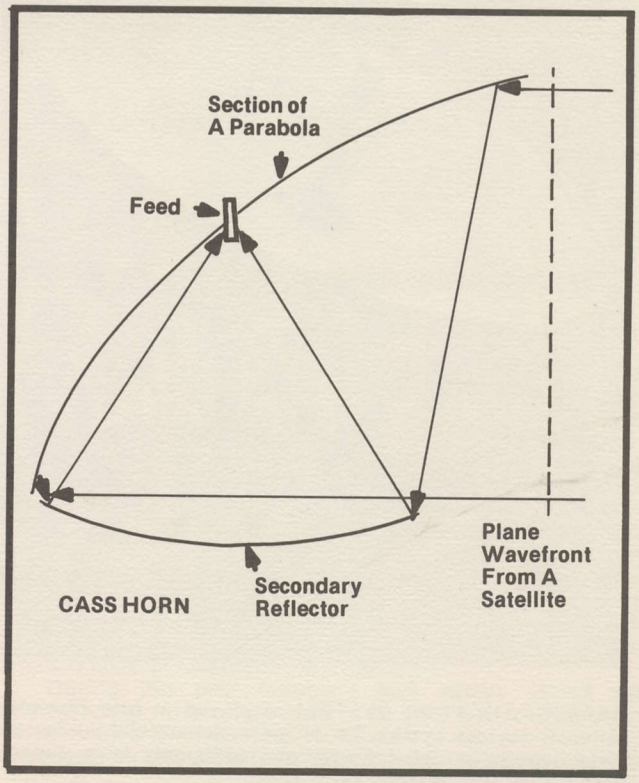
CASSEGRAIN REFLECTOR SYSTEM



HORN REFLECTOR ANTENNA SYSTEM

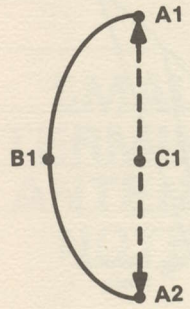


SHAPED CASSEGRAIN REFLECTOR SYSTEM



CASS HORN

CALCULATING f/d



1]Measure A1-B1 to determine radius.

2]"Halve" the A1 to A2 measurement [i.e. C1 point] and measure at a right angle from C1 to B1 [reflector surface at deepest point].

3]Focal length [f1] is equal to $f1 = \frac{[A1 \text{ to } B1]2}{4\,[x]\,C1 \text{ to } B1}$

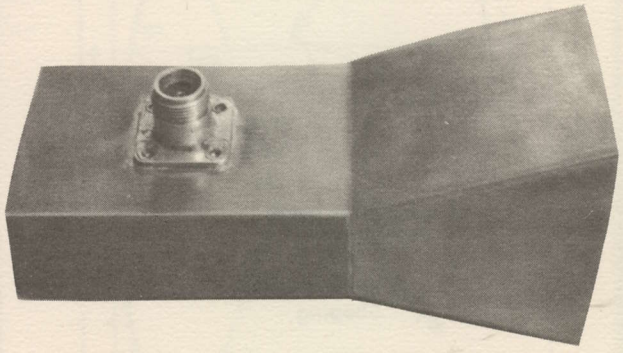
THE COMPONENTS SCENE

SURPLUS WAVEGUIDE/FLANGES

Waveguide components are a necessary evil for design and construction of TVRO terminals on a private basis. You might get away without any of the plumbing, but it certainly is easier to get into and out of antenna feed horns and the like if you have the appropriate flange!

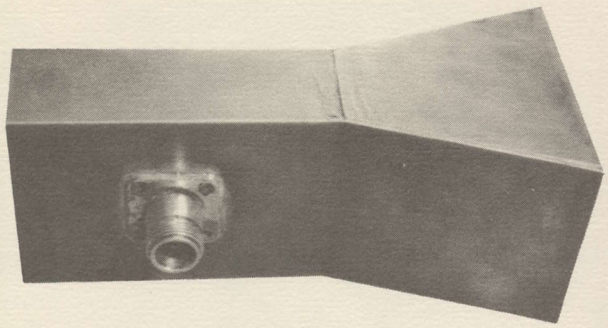
A waveguide is a section of transmission line. Only it **typically** has physical measurements which restrict its use to only a portion of the microwave spectrum. The same thing is true with waveguide flanges and fittings. Operating a system in the 3.7 to 4.2 GHz range with a flange designed to pass only microwave signals from say 7 to 11 GHz (i.e.WR-102)will result in very poor (if indeed any!) performance in the 3.7 to 4.2 GHz range. The physical size of the waveguide in this example is simply not large enough to propagate the 'longer' wavelengths in the 4 GHz region.

New waveguide and fittings are expensive. One source, if money is no object, is **Lectronic Research Labs, Inc.** (Atlantic and Ferry Avenue, Camden, N.J. 08104; 609-541-4200). However on the surplus market, meaning at Hamfests, through telephone company disposal yards and anywhere old, dis-carded microwave gear gathers, you may stumble across fittings which can be pressed into service either as is or with some subtle modifications. An example of what can be done with a piece of waveguide is shown here; not in construction detail at this time because developer Robert Coleman is still analyzing the performance of the unit. However, Robert has



taken a piece of WR-229 waveguide (intended for the 4 GHz service), and he has split two sides to allow him to expand or flare the waveguide into a feed horn. The flared portion has been married to another piece of metal to form the 'V' shaped sides on the horn. In Robert Coleman's case, by having a box filled with surplus waveguide he had the basis for this feed horn already on hand and therein is the story; be prepared to shop for and collect surplus waveguide and flanges and fittings because if they are in the proper frequency range you can either use them as-is or turn them into a useful device.

CASSEGRAIN FEED SYSTEM employed in new fiberglass reflector surface system for Hughes commercial customers. Note hyperbolic sub-reflector and extremely long, tapered horn feed at sub-reflector focal point.



To help you select what is useful and what is not useful, here is a table of the commonly found waveguide components available on both the surplus and new equipment markets. Very seldom will you find the operating **frequency range** stamped or stenciled on the piece but almost always you **will find** the WR number type in place someplace.

WR Series Number	Frequency Range
WR-8	90 to 140 GHz
WR-12	60 to 90 GHz
WR-15	50 to 75 GHz
WR-28	26.5 to 40 GHz
WR-34	22 to 33 GHz
WR-42	18 to 26.5 GHz
WR-62	12.4 to 18 GHz
WR-75	10.0 to 15 GHz
WR-90	8.2 to 12.4 GHz
WR-102	7 to 11 GHz
WR-112	7.05 to 10 GHz
WR-137	5.85 to 8.2 GHz
WR-187	3.95 to 5.85 GHz (*)
WR-229	**3.3 to 4.9 GHz**
RG-109/U	2.6 to 3.95 GHz (*)
WR-284	2.6 to 3.95 GHz (*)
WR-340	2.2 to 3.3 GHz
WR-430	1.7 to 2.6 GHz
WR-650	1.12 to 1.7 GHz
WR-975	0.75 to 1.12 GHz
WR-2100	0.35 to 0.53 GHz

* - Some portion of the design frequency range overlaps with a portion of the 3.7 to 4.2 GHz band but this series will not properly cover the **full** band of interest.

MIL (military) Spec (specification) parts may have supplemental numbers in place of or in addition to the standard WR series numbers. A detailed list for all of the frequency bands available would not be a wise use of space. However, for the 3.7 to 4.2 GHz region, here are the applicable numbers:

MIL Type	Type Device	MIL Waveguide #	WR Series
UG-1350/U	Choke	RG-340/U	WR-229
UG-1351/U	Choke	RG-341/U	WR-229
UG-1726/U	Cover	RG-340/U	WR-229
UG-1727/U	Cover	RG-341/U	WR-229
RG-48/U	Waveguide	RG-48/U	WR-284
RG-49/U	Waveguide	RG-49/U	WR-187
RG-75/U	Waveguide	RG-75/U	WR-284
RG-95/U	Waveguide	RG-95/U	WR-187

In the WR-229 series, other than the basic waveguide, there has not been a long list of other 'attachment components' develop. What you are apt to find will be flange adapters (CMR-229/CPR-229F), 45 degree 'H' bends and 90 degree E bends, and flexible sections with a neoprene jacket from 12 to 24 inches in length.

PARTS SHORTAGES

A number of hard to second-source parts have become very difficult to obtain during the late summer and early fall. The explosion of interest in 3.7 to 4.2 GHz microwave technology at all levels is blamed by most suppliers who simply were not prepared for the onrush of purchasing interest.

One of the more critical items is Duroid circuit board. For those not aware, you do not print LNA or other 4 GHz circuits on G-10 board! The loss in this non-teflon board material will eat you up in circuit losses in a hurry. There are several sources for the right kind of circuit board around; 3-M has a board designed for microwave available but many people such as Taylor Howard recommend that you **not** use this 3-M product line because of past problems with it. The primary supplier is Duroid board is the **Rogers Corporation** (Box 700, Chandler, AZ 85224). Their Grade D-5880 226-127 with a thickness of 0.031 dielectric, clad 1 oz (two sided) has become the mainstay of many circuit board suppliers in this area (such as Robert Coleman). Lead times have stretched however to the point that orders placed today will show up in about 90 days time. Coleman and others report they are running behind in deliveries as a result of this delay.

Another critical item similarly impacted is the doubly balanced mixer which until now has largely been available (at a reasonable price) exclusively through **VARI-L** (3883 Monaco Highway, Denver, CO 80297). Lead times at VARI-L have also stretched to as much as 90 days from the date of order. A new second source, **not yet delivering** but promising to deliver shortly after the first of the year, is **Engelmann Microwave** (Skyline Drive, Montville, N.J. 07035). Engelmann has recently completed R and D on a new 3.7 to 4.2 GHz DBM package which they suggest they will be offering in the $65 to $75 price range (small quantities).

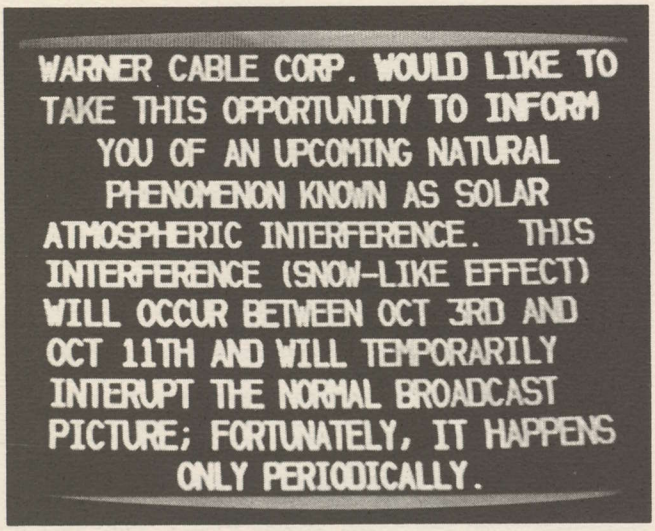
SMALL SYSTEM APPLICATIONS

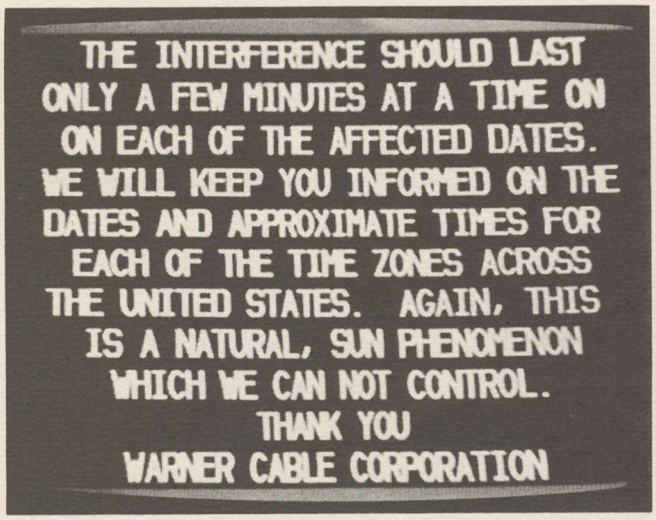
SUN OUTAGE

It happens during two periods each year. The Sun (our Sun!) aligns itself with the geostationary satellite your receiving terminal is pointed at and the full power output of the Sun, as a noise source, is received by your receiving system.

Fortunately the effects are short lived; thanks largely to (1) the beamwidth or pattern on your dish, and, (2) the peculiar celestrial mechanics that must be created to put the Sun **directly in line** (but behind by some 93,000,000 miles) the satellite of interest. The two periods of the year so impacted are plus or minus (typically) 20 days from the equinox (September 21st and March 21st) but because of the beamwidth of your antenna system the precise alignment required for the Sun's solar noise to interfere with the geostationary satellite signal typically lasts for less than 15 minutes time.

During this past October's Sun outage period we photographed the progression of the Sun outage on transponder 3 (WGN) as the Sun moved into alignment with FI, and then slowly crept out of alignment. In year's past we have





SOME SERVICES such as STAR CHANNEL advise viewers of the impending solar noise contest.

videotaped the event and even recorded it using a field strength meter driven by the 70 MHz output of the i.f. on our TVRO receiver.

Some of the services have graduated to the point where they advise their viewers of the short term 'interference' but most services simply ignore the problem knowing that it will be the cable company (not them) that gets the calls. A typical outage will last from 3 to 15 minutes with ten foot or larger antennas (smaller antennas have wider front lobe beamwidths and therefore see the Sun longer). The date when the Sun's alignment was most nearly perfect for our Oklahoma location was October 8th and the time was just after 4 PM central time for FI. As you might suspect, since in the fall the Sun is moving slowly more southward in the sky with each progressing day locations in the southern U.S. see the Sun first and as the Sun moves south the more northerly locations have the brief interruption in service.

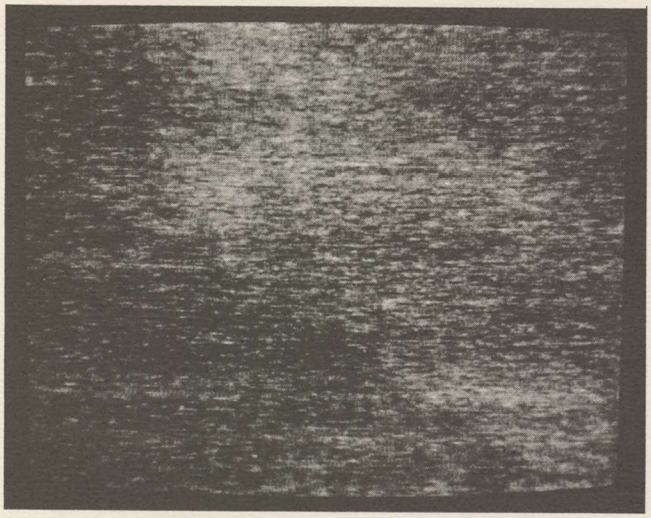
The visual effect of the Sun outage is for the normally crystal clear picture to slowly develop a case of the 'sparklies'. In approximately ½ of the total outage period (from the first hint of sparklies until the last hint) the interference reaches a peak. It has been observed that our 5 watt output transponders, coupled through 29 dB gain antennas on the bird

[1]

[2]

[3]

PROGRESSIVE wipe out of satellite signal is shown in this picture sequence. Service re-establishes in reverse order.

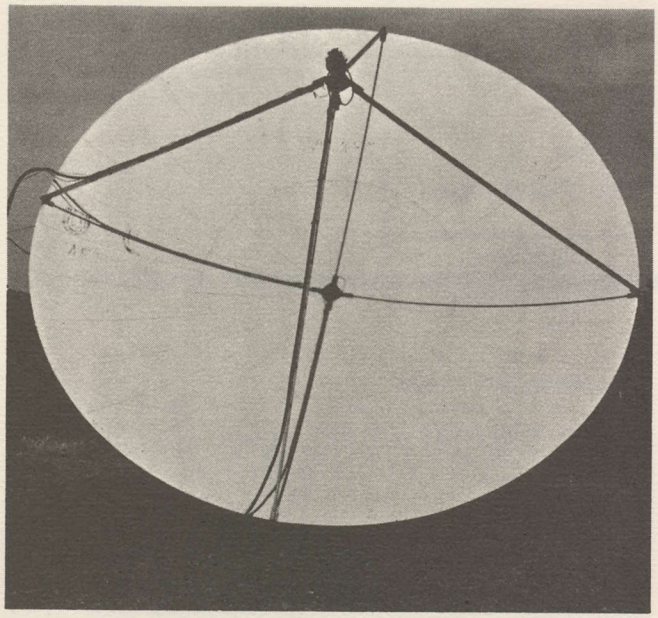


[4]

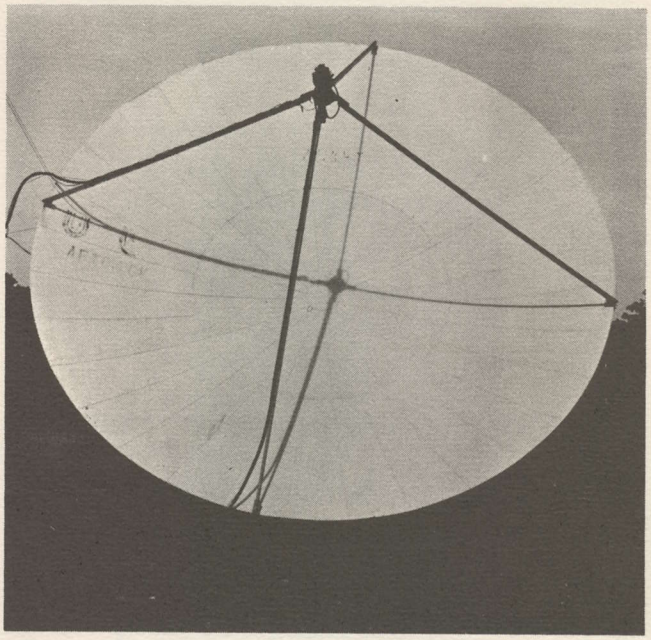
(at boresight) produce an effective radiated power that is **almost exactly equal to** the Sun's noise output in the same band at the same time. Which is another way of saying that the Sun's "signal" at 93,000,000 miles is equal in strength (as a wide band noise source) to the satellite's signal at 22,300 miles. As the photos here show, the extent of the 'wipe out' is almost complete at the point of peak interference.

Oh yes, you can tell when the solar outage is approaching your location if you have a prime focus feed on your antenna by checking on the path of the shadow made by the Sun with the prime focus feed. When the Sun exactly aligns with the satellite, your prime focus feed antenna is in turn aligned with the satellite and this causes the sun to cast a shadow of the prime focus feed system precisely in the center of the antenna reflector surface.

This is that twice-a-year point where your LNA had better be protected against heat build-up, and, your reflector surface had better have some type of light scattering paint in place.



WATCH YOUR REFLECTOR for alignment of the prime focus feed shadow with the precise center of your reflector surface; that's a sure sign the Sun is in line with the geostationary satellite.

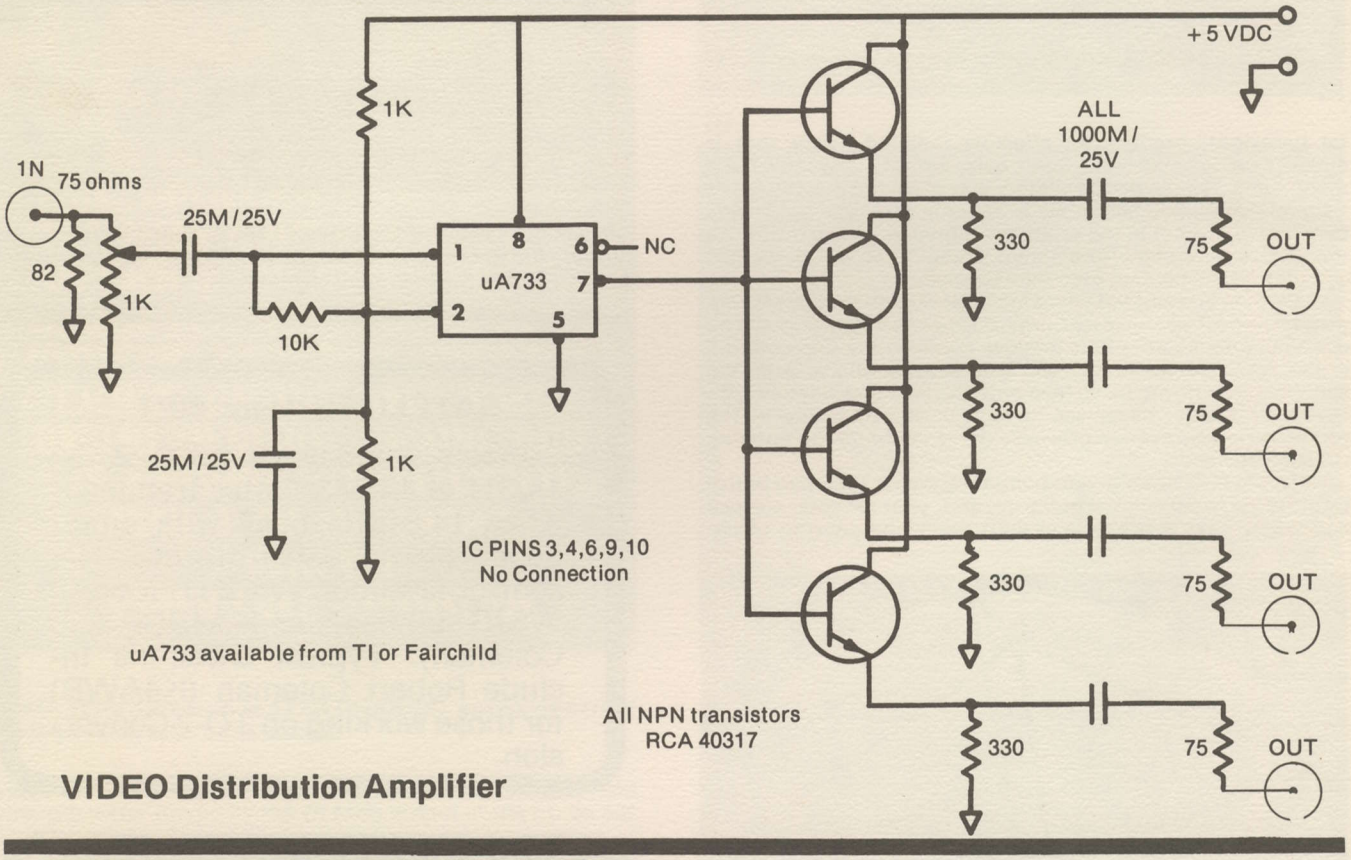


You wouldn't want to 'cook' your LNA or feed electronics by allowing the sun to focus its output on the reflector surface and then re-focus to the feed point electronics!

SATELLITE 'Ham' NET

...meets Sunday at 1900 Z on 14.311 **or** 14.343 (latter frequency when 14.310 is busy with emergency phone patch traffic). Net control is either W5KHT (Coop), W5JG (Lindsey) or KA4BCF (Lib Coleman). Typical check-ins include Robert Coleman (K4AWB) for those working on TD-2 Conversion.

BASEBAND INTERFACING UPDATE



VIDEO Distribution Amplifier

TECHNICAL CORRESPONDENCE AND NOTES

WRONG EVERYTHING...

To set the record straight on the item appearing on T16 (October CSD) concerning Ariane, which CSD describes as 'African based semi-private funded rocket launch system developed largely by German engineering and money...'. I believe you may be confusing the European Space Agency's Ariane system with the now defunct Otrag system. Ariane is a launcher with Atlas-Centaur capability produced by the governmental European Space Agency with the biggest participation by the French government. It will be launched from Kourou, which is in French Guyana, on the northeastern coast of South America. Otrag, on the other hand, is a somewhat mysterious organization that had been attempting to launch a rocket from a site in Zambia, until their prototype blew-up on the pad and the German government ordered them to cease activities in Europe. I feel sure my friends at the

European Spage Agency would be horrified to think they were being confused with Otrag.

Jonathan Miller
Managing Editor
Satellite Week
Washington, D.C. 20036

Jonathan is totally correct; which is something Jonathan usually is! The Otrag group was thought by some with a suspicious mind to be a 'cover operation' **that was really concealing some sort of German backed** (private) **effort to create for the group a worldwide rocketry base perhaps for not totally peaceful purposes. With the many restrictions placed on German military power at the end of WWII, there is probably no way anyone with German backing could have gone into the Rocket business** on German soil **proper. Someday someone with far better sources than either Jonathan or Coop may produce a fascinating book on this subject. Thank you Jonathan for setting the record straight.**

SWAN FEED

Can the Swan feed horn for the Spherical antenna be constructed out of a material such as copper? If so, is there some advantage to this? What about stainless steel or other alloys since copper is a soft metal?

Paul Fox
Washington, D.C.

Far more critical [with one exception] than the chosen material for the 'deep throat' feed on the Swan Spherical is that care with which the builder duplicates the design from the manual. Actually, virtually any durable metal will function within a tenth dB or so of any other similar metal. A friend of Oliver's qualified to undertake such an analysis [Bill Ott of Bisbee] determined that the user might pick up a maximum of 0.2 dB system gain by plating the galvanized sheet metal in use by Oliver on his feeds with a silver solution. This is a double plating job however as silver will not directly 'take' to galvanized metal. The one exception that you do want to avoid is PC board. Double sided board almost has to be used because of mechnical reasons and you end up with two surfaces offset from one another by the width of the insulating material. These parallel 'planes' tend to create all sorts of unpredictable surface currents in the 4 GHz energy and as Oliver says you cannot even begin to estimate the mal-performance of a feed horn constructed from double sided PC board. So avoid it, perhaps wisely, for all feed horns!

FILTERS AND CHIPS

Thank you for the prompt delivery of the Howard Terminal manual. Can you tell me if:

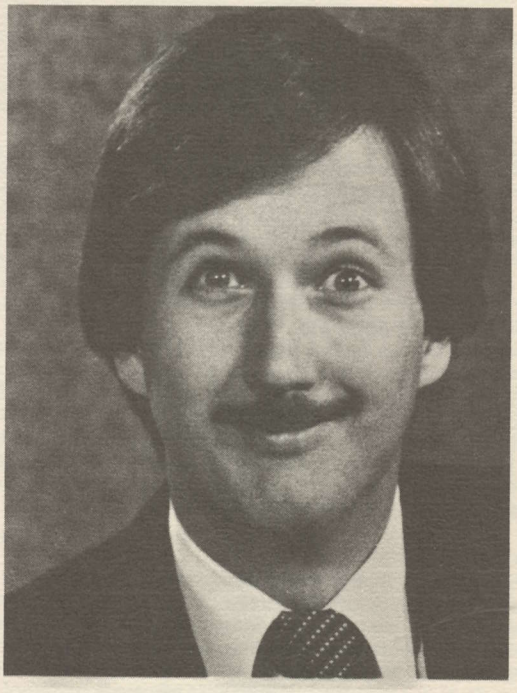
1) There is a magic number for the bandwidth of the 1200 MHz bandpass filter utilized in the Howard high i.f.;
2) What the value is for the chip bypass capacitors in the bi-polar LNA described in the Howard Manual?

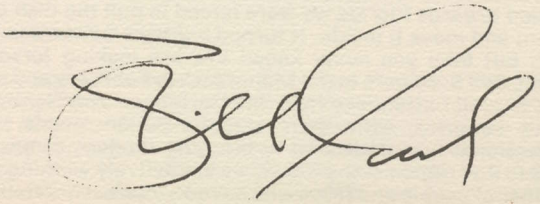
Adam Robbins
Manhatten Beach, CA 90266

The 1.2 GHz bandpass filter should have 3 dB skirt selectivity in the 35 to 40 MHz range. The real selectivity in the system is determined at the 70 MHz i.f. and as long as the 1200 MHz i.f. passband is adequate for slightly more than a single channel you should have no difficulties with chopping valuable baseband material in this section. The chip capacitors are typically in the 200 to 300 pF range with 270 a common value. They are not critical as to value and some experimenters are getting along fine with values as high as .001. They must be chip capacitors however!

BACK TO BASICS

It has been a long time since I have had as much fun as I did at SPTS '79. It reminded me of my early days in amateur





radio when it was all new and exciting. You put together a most interesting program.

You may recall that Tay Howard introduced us. I've talked with Tay about the possibility that a number of people just getting started with system design (and perhaps the old hands as well) might be interested in a presentation on some of the basic terminology of satellite TV reception. If you are interested I would like to put together a 30 to 45 minute presentation that could touch on some of these subjects. Units of measurement, their use and origins have interested me since I was an undergraduate and I think it is possible to present such information in a manner that is informative while not putting people to sleep. The ultimate purpose of such a presentation would be to leave SPTS attendees with a clearer understanding of such things as EIRP, space attenuation, the T (temperature) factor as it relates to microwave antennas and receivers and so on.

Jack E. Trollman
Mountain View, CA 94040

Jack, who is presently a member of the technical staff at ARGOSystems, Inc., is one of the many very talented people now working on his own nickel in this field simply because it excites him. We expect to see Jack's presentation on measurement basics at an early SPTS in 1980 and possibly as an article here in CSD before that time.

SURPLUS MICROWAVE

After receiving your Home Satellite TV Reception package I acquired a used microwave TV relay system; a Raytheon KTR-1000A receiver and control system presently operating in the 7 to 8 GHz region. I would like to know if this could be utilized for DOMSAT private use. If not, could you send me some information on who might know the answer to this question?

Jimmy W. Word
Route #2
Killen, AL 35645

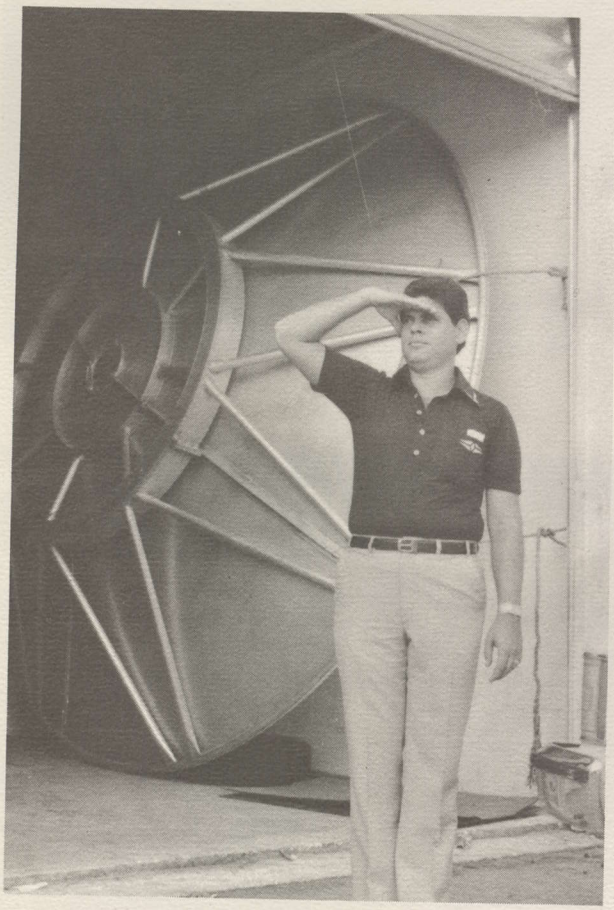
We are not familiar with the Raytheon KTR-1000A but the fact that it is now operational in a band nearly an octave [i.e. 2 times] higher in frequency than the DOMSAT band of interest suggests to us that you are at best going to have problems with the GHz input end of the system. Waveguide inputs, flanges, mixer or mixing cavities and so on are dimensioned to fit the size or length of the GHz energy they are designed to intercept and ultimately demodulate. We suspect the mechanical signal handling hardware in the input side of this system is simply operating 'above cut-off' [i.e. at a frequency where 4 GHz energy is severely attenuated] and while it might [that's an uneducated might!] be reconfigured so as to electrically operate at 4 GHz we would expect that you would have to do major mechanical [metal bending] surgery to the input to get it to even pass 4 GHz energy. Perhaps one of our readers is more familiar with this piece and will write to you directly.

WEATHERPROOF

Down here in the hurricance belt anyone with a TVRO system has to take special precautions to insure that when a storm is coming that we have someplace to stow our terminals. Here at A-B Electronics we have our 12 foot (Anixter-Mark) prime focus feed dish mounted on a polar mount on the south side of our building. When this season's group of storms headed towards Florida we were forced to pull the dish off the mount and move it inside. It turned out to be unnecessary this year; but then you never know! We are looking forward to having SPTS '80 here in the Miami area in February and will be glad to assist attendees from the Caribbean and Central and South America with their communication needs. As a professional firm dedicated to bringing modern communications to that region of the world, we are actively working with a number of people and firms who have an interest in satellite TV

reception outside of the U.S.

Robert Behar
A-B Electronics, Inc.
1783 West 32nd Place
Hialeah, FL 33012



Behar is shown here watching . . . and waiting, with A-B's 12 footer safely out of the way of hurricane force winds. A-B Electronics recently completed acquisition of a New York state firm called VHF Engineering; one of the prime manufacturers of VHF and UHF communications equipment. VHF Engineering is being moved to Hialeah where the product line will be expanded in 1980 to include some TVRO receiving hardware. One of VHF's more interesting products is a ten watt UHF [TV] range transmitters which can be adapted to companion VHF Engineerig 100 watt amplifiers to provide low cost re-distribution of satellite TV signals in areas of the world where the system can either be licensed or allowed. Behar will be a part of the SPTS '80 program where he will describe the system that includes low cost receiving converters.

MICROCOMM APPLICATION NOTES

A number of "app-notes" prepared by H. Paul Shuch of Microcomm (14908 Sandy Lane, San Jose, California 95124) are available. For **each** app note requested send $1.00 (U.S. currency; outside of U.S. send 3 IRC's per app note) **plus** a stamped (15 cents U.S., extra payment outside of U.S.) self addressed envelope.

TECHNICAL LITERATURE AVAILABLE

Title	App-Note #
Solid State Microwave Amplifier Design	1
Cost Effective Modular Downconverter for S-Band WEFAX Reception	2
A Vidiot's Guive to Microwave TV Links	3
Antenna/LNA Tradeoff Analysis for 3.7 to 4.2 (TVRO) video terminals	4
Microstrip - Magical PC Technique Explained	5
Calculating Antenna Bearings for geostationary satellites	6
Calculating Preamplifier Gain from Noise Figure Measurements	7
A Low-Cost Modular Receiver for DOMSAT Video	8
A Low-Cost Microwave Spectrum Analyzer	9
RX-1691 Instruction Manual - complete schematics, installation and application information for S-band Weather Satellite downconverter. Note: Price is $10 in U.S., $12.50 elsewhere.	10
RX-4200 User's Manual - complete schematics, circuit descriptions for Microcomm downconversion module set for 3.7 to 4.2 GHz video (DOMSAT) reception; includes circuit information for compatible baseband processing unit. Note: Price is $25 in U.S., $30 elsewhere.	11

SATELLITE INNOVATIONS

Satellite Innovations (P.O. Box 5673, Winston Salem, N.C. 27103) has a variety of microwave and satellite parts, plans and supplies including chip capacitor kits, feedhorn tubing (2'' diameter), Teflon PC board and various sub-assemblies for a TVRO receiver plus plans for a polar mount and rotating feed horn. Inquire directly.

ROBERT M. COLEMAN

Satellite experimenter Robert M. Coleman has a number of PC boards and chip capacitor kits available for the construction of GaAs-FET LNA stages, bi-polar LNA stages, an active mixer utilizing a GAs-FET device and AVANTEK VCO. For full information contact Robert M. Coleman, RFD 3, Box 58-A, Travelers Rest, S.C. 29690.

MICROWAVE GENERAL

Microwave General (2680 Bayshore Frontage Rd., M.S. 210, Mountain view, Ca. 94043) has a data sheet describing a 10 foot diameter 3.7 to 4.2 GHz reflector equipped with a high efficency Cassegrain feed system which they claim makes the ten foot reflector function with gain equivilent to a full 12 foot parabolic. The antenna is molded, one-piece construc-

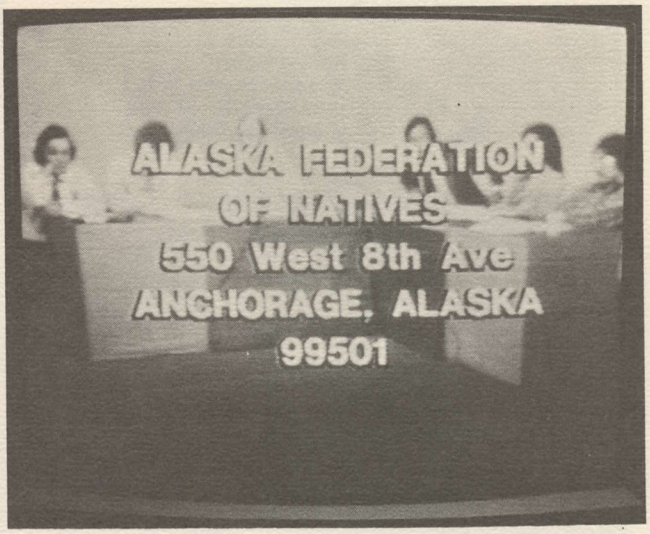
tion, with a flame sprayed relective surface. Full details are available directly from MG.

INTERNATIONAL CRYSTAL MFG CO.

ICM (10 North Lee, Oklahoma City, OK 73102) has a data sheet describing their newly released TV-4200 satellite receiver; a 24 channel frequency agile double conversion receiver with dual audio outputs for 6.2 and 6.8 MHz. Contact ICM for full details.

AVCOM OF VIRGINIA INC.

AVCOM has a short-form manual that describes their PSR-3 satellite receiver designed for 'low cost reception' of satellite video (and other modulation format) signals. Contact AVCOM at 10139 Apache Road, Richmond, VA 23235.



TECHNICAL NEWS NOTES

NASA completing tests of new bandwidth compression system that claims to allow 'full motion, high resolution color' transmission in bandwidth approximately 15% of present bandwidth. NASA also working on Ku (11/12 GHz) band transmit antenna system for bird(s) that will allow breaking U.S. area up into 17 decrete 'antenna patterns' for descrete feeds. Similar approach on C band (4 GHz) is feasible, but with approximately 6 descrete beams rather than 17.

Australian 'tests' using nearly dead CTS-Hermes bird were successful. Tests included moving 11/12 GHz experimental bird to position over Pacific so bird could be transmit-accessed from Canada, received in Australia. Approximately 50 Canadian built terminals with mass production retail cost in $2,500 region were installed using NTSC Sony receivers for local display in Australia. Australian programming was taped in Sydney, flown to Canada where it was reconverted to NTSC and sent via bird. Canadians want to get piece of Australian satellite hardware buying dollar and test was elaborate show and tell towards that end.

A series of Hurricanes this summer wiped out Santo Domingo, Dominican Republic INTELSAT terminal. Problem became severe late in September when local TV stations found they were going to have to go without normal INTELSAT fed Major League baseball and World Series games. One station decided to bite the bullet, procured 11 meter Harris (RMS) receive antenna through southeastern U.S. firm. Antenna was installed by late in September with 120 degree LNA and SCI receivers on third floor roof of station. Local INTELSAT representative immediately took issue to government telling them station receiving signals via U.S. domestic birds would violate 'domestic bird' nature of U.S. satellies. Station responded by editorializing every 30 minutes over air that unless government approved service, island would go without World Series since INTELSAT station was unable to deliver programs. Station won after pickets for baseball showed up throughout city. Interesting footnote: system showed that SATCOM FI service in area (with 11 meter antenna) was well above sparklie level, FI measured hotter than WESTAR II while COMSTAR III was 'overpowering'. Station had previously been budgeting approximately $100,000 **per year** for INTELSAT feeds of occasional events; full 11 meter terminal cost them under $90,000. Controversy over station's legal right to access U.S. domestic satellite(s) continues.

RCA, reportedly unhappy with 'NASA attitude' over shuttle program, is talking with Ariane about launch of SATCOM IV. Reportedly if RCA can find another satellite to piggyback with IV, they may go offshore for launch.

ABC latest radio news network to get serious about AOT (Audio Only Terminals). Has asked for detailed proposals from all three satellite system operators, would utilize 3.3 meter dishes, possibly digital audio technique, 'stereo quality' and total affiliates involved is 1,600.

WESTAR now testing 3 for 1 digital video on WESTAR I transponder 10; capable of sending three complete sets of video (with digital techniques) through a single 36 MHz wide transponder.

Soviets have placed fourth Statsionar T (Ekran series) bird into orbit with 714 MHz downlink (see detailed report this issue CSD). Bird is believed to be in place replacement or standby for older satellite now nearing end of projected Soviet service life.

COOP'S SATELLITE DIGEST P1 - 11/79

COOP'S COMMENT ON PROGRAMMING

Programming Rights Confusion

As virtually anyone who owns a VCR now knows well, Judge Warren Ferguson has found for Sony in the copyright infringement law suit brought by MCA, Disney and other 'friends'. The three year old case asked the court to determine whether or not television viewers, in the privacy of their own homes, using a VCR machine they owned, were paying on or borrowed from a friend, could videotape over the air broadcast television programming without violating the Copyright Laws of this country. The Judge decided that what you do with a VCR in your own home is pretty much your business; that no copyright laws were being abridged when you videotape the local NBC (et al) station programming for later view or review.

Nobody who really knew very much about this case ever apparently felt that Sony (who was being named as the defendent because of their stellar marketing position in home VCRs some three years ago) was in much danger. However, just to be safe, and sure, Sony (and other VCR marketing firms) have been placing small print on their advertisements and in their instruction booklets by way of telling purchasers or prospective purchasers that Sony (et al) made no claims or representations about the buyer's right to videotape Bonanza or whatever. The case will undoubtedly wind its way through the appeal routes and I suggest it will be struck down at each turn.

In spite of Sony's small jeopardy in this suit, many people were on eggs awaiting the verdict. The case was complicated and the evidence overwhelming if not damaging. Now the ruling is out, one would expect a change in the advertising stance from all VCR manufacturers with more open-touting of the 'time shift' and 'repeat viewing abilities' of the home VCR unit. Alas, the decision for Sony and against MCA and Disney and their ilk does absolutely nothing for the more pressing question in satellite TV land. That being, who owns the rights to what; when?

Already CSD is receiving letters from readers and others who are proclaiming with newspaper stories attached, that "the way is now clear for anyone who wishes to tune in HBO (etc.) off the satellite to do so without fear of legal complications...".

Wrong. **Double wrong.**

First of all Judge Ferguson was very explicit about videotaping anything **except** terrestrial (broadcast to the public) television. He said **"This court is not deciding whether tape duplication, or copying from pay TV, is prohibited."** He went on to note **"The ramifications of this new technology are greater than the boundaries of this lawsuit. A court reviewing the limited claims...in a particular factual setting cannot and should not undertake the role of a government commission or legislative body exploring and evaluating all the uses and consequencies of the videotape recorder..."**.

So if you have been told that the 'Sony Suit' decided that you are (1) free to view (and/or videotape) off-air pay TV (as in STV) in your home, or, (2) free to receive MDS in your home without paying for it, or, (3) free to intercept and view satellite TV channels in your home for which you have no authority to view...you have been told wrong. The suit was very narrow and the Judge wisely footnoted just how narrow it was. In fact he seemed to be saying that he was handling all of the case he could handle by concentrating on the relatively simple question of videotaping for private, non-compensatory viewing in one's own home.

Does that mean that satellite (or MDS) viewing without authorization (or contract) **is** illegal, even when conducted in the privacy of your own home and without any 'benefits' derived? Who knows.

Congress was, until recently, on track to update the 1934 Communications Act. The updating, originally spearheaded by Congressman Lionel VanDeerlin (D. from San Diego) who heads the House Subcommittee on Communications, intended to rewrite the oft quoted but ill understood Section 605. In fact, section 605 was destined to become section 549 and in their Subcommittee report the House said of Section 549 (to be):

1) Section 549(a) would amend 605 so that 'secrecy of communication' charges could only be brought against employees of Common Carriers; not against 'persons' (i.e. the public) at large.

The logic here was that people engaged in the transmittal of 'private materials' were especially capable of 'intercepting and benefiting from' the content of these 'messages'.

So even **with** the Sony/Disney decision we have no clear cut direction for the nagging question of the satellite age; who owns what, when? This leaves us with an antiquated Communications Act that talks broadly of using private material for personal benefit without adequately defining what is private and when you benefit. We have a more modern Copyright Act, passed in 1976, that addresses such entities as cable television systems engaging in long range television reception (for a fee, and establishing a Copyright Tribunal to collect those fees) but it too misses totally the question of you, sitting in your home, with a private satellite terminal tuning in Hee-Haw from WTBS. The simplistic answer oft quoted is that you, an individual in Bozeman, are simply a 'small cable system'. And having defined what you are, they suggest you send your $60 per year per channel to Washington for the Copyright Tribunal slush fund!

This too is a woefully short solution to a real world problem. But...does anybody have an answer. Clearly the law does not.

CSD

PROGRAMMING

COOP'S SATELLITE DIGEST (Programming Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Programming and Technology) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. or Canada add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing.

SWAN SPHERICAL SUCCESS STORY

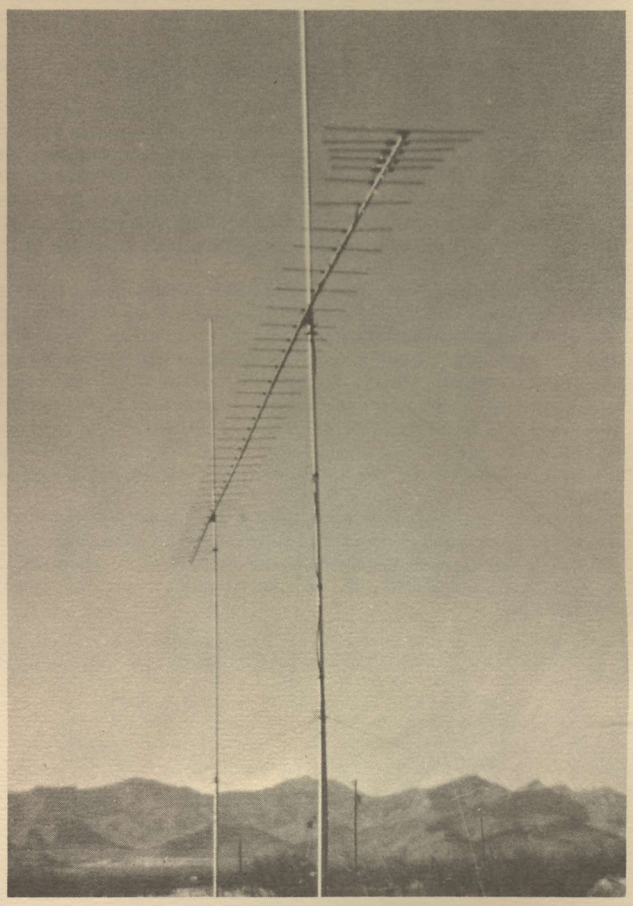
OLIVER'S DREAM

Oliver Swan is an antenna wizard. He has been an antenna wizard since the early 50's when, in Stockton, California, he spent months creating the design for the first commercially offered log periodic type antenna design. Stockton, in those days, had no local television. San Francisco VHF television came over the coastal mountain range and the 5 Kw transmitters and short transmitting antennas of that era made the 70 or so mile jaunt to Stockton a long one indeed. Most TV addicts watched snowy San Francisco television on stacked conical antennas although a few had bothered to install multiple yagi arrays; one for each of the then active channels (4, 5 and 7). Oliver decided that there had to be a way to **combine** the broad bandwidth of the conical with the gain and directivity of the yagi. He recognized that the yagi was a "hi-Q" (or selective as in narrow bandwidth) antenna primarily because **(1)** the driven element has a resonant frequency and that frequency is fairly well defined, and, **(2)** the directors and reflector(s) are like bandpass filter elements; they too are resonant. Oliver Swan's approach was to make all of the elements 'active' (as in making them all driven), and tapering the multiple driven elements over the frequency spectrum of interest. And so the first log periodic was born and put into manufacture in Swan's small antenna shop on the outskirts of Stockton in about 1952.

Oliver's approach to antenna design has never previously attracted **widespread** interest. His VHF television antennas were popular in his area but lacking the financing and marketing experience required they stayed a local antenna sold largely to a handful of dealers and direct. He later expanded the multiple driven element antennas to the amateur VHF and UHF bands and today's **KLM** (amateur) antenna line traces directly back to Oliver Swan who sold the amateur line of antennas to the KLM folks some years ago before 'retiring' to Arizona.

Once in Arizona, settling on a 160 acre tract homesteaded by his grandfather back when Bisbee was just starting to turn into an important center for retrieving copper from the earth (one of the largest open pit copper mines literally swallows up the town), Oliver Swan went to work on bringing television to rural residents around Bisbee. There is no local television for Bisbee; the nearest U.S. transmitters are licensed to Tucson, more than 120 miles by air. Bisbee, like many such communities, has cable. But not everyone in Cochise County lives in Bisbee; in fact the area is literally dotted with small settlements largely made up of retired Americans looking for sunshine and warm year around weather in their 'golden years'. Plus the usual smattering of hard crusted natives who were born here, married here and will one day be buried adjacent to an open pit copper mine.

While in Stockton Oliver Swan perfected the sometimes elusive trick of spotting 'knife edge refraction'; a tricky at best propagation mode that abounds in small spots in mountainous country wherein VHF and UHF signals bend or



ULTIMATE LOGI - Swan's log periodic approach, married to a considerable series of passive directors [and single reflector] resulted in 40 element long boom array in mid 70's. Mountain peak in background provided knife edge refraction from 120 mile plus distant high band VHF TV station.

refract over well shaped mountain peaks to 'illuminate' smaller yet patches of soil tens or hundreds of miles distant. Knife edge was the best way of finding Tucson (and Phoenix although it is more than 200 miles north) VHF TV signals. With the patience of Job and the skill of a man wise in the ways of locating water in a desert, Oliver out with 'divining rod' in hand (a dipole antenna in his case) and a field strength meter and began probing for distant signals. Wherever he found Tucson and/or Phoenix signals he calculated how many homes could be served from each 'site'. Often there would be a dozen or two within say a couple of miles of 'cable' and there Oliver would establish a miniature Oliver Swan bred "cable TV system". Today Oliver has more than a dozen such cable systems with typically 50 or fewer subscribers per system.

With the produce from his 160 acres, a devoted family and the kindness of nearly perpetual summer the meager income from perhaps 450 cable subscribers has allowed Oliver to make ends meet, take care of his family, and dabble.

It is the latter . . . the dabbling . . . **that interests us mostly here.** For several years ago Oliver began dabbling with something called a 'Spherical Reflector'; a rather unusual type of antenna that is related by lineage to the parabolic family. Aware that his knife edge refraction signals were often very weak, and present only in small patches perhaps 100 feet or less across and half that depth, Oliver had always tried to build VHF off-air antenna arrays that would capture every last microvolt from the distant transmitters. **"When you start off with perhaps 5 microvolts on a dipole you have a long ways to go to reach a snowfree picture"** he would muse and then proceed to measure and determine the limits of the area 'illuminated' by the knife edge signal, and having done so return to the drawing board to conceive an antenna array that would fill the area with aluminum. Eight and sixteen bay Swan Logi arrays were typical answers; usually 4 or 8 antennas wide and two antennas high.

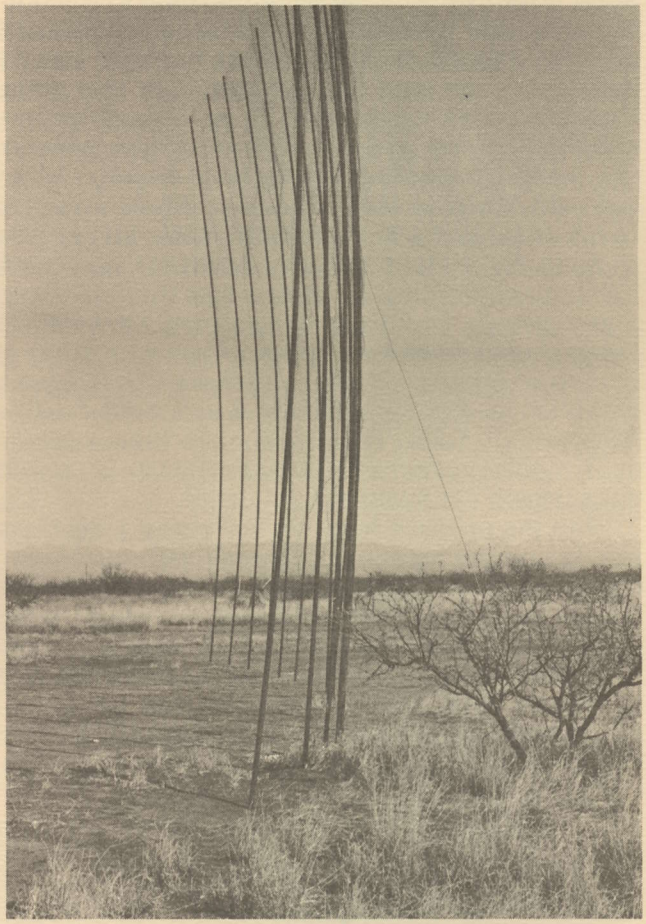
As any experienced antenna person knows well, two or more antennas, when stacked or phased are supposed to add 3 dB maximum additional signal voltage each time the physical size of the array is doubled. However, as anyone who has practiced this art is aware, between the 3 dB theory and the real world you may often lose almost as much as you gain through the phasing lines and harnesses and couplers and connectors. So Oliver thought about the problem.

And thought and thought. And he decided that since gain was related to capture area of the antenna, the best approach would be a single reflector surface, concave in design so that all of the energy intercepted by the array (which typically would 'fill' the area illuminated by the knife edge refraction) would be re-focused to a central point. **"In this way a single, even simple, feed point antenna could be installed at the 'focal point' of the reflector surface and the gain of the system would be the sum of the reflector surface focused energy plus the gain of the feed or focal point antenna; less the inefficiency of the reflector surface".**

And so, some three years ago, the 'Swan Spherical **TV** Antenna' was hatched; Out of steel pipe and guy wire and 2 inch opening chicken wire mesh. Devoted followers of the **Satellite Magazine** program (transponder 21, Thursdays, 12 noon eastern) will recall a three program series this past spring during which Oliver took viewers on a tour of his off-air VHF Spherical reflector antenna systems.

There were doubting Thomases of course. In spite of the fact that a very similar antenna had been co-conceived at about the same point in time by the Chief Engineer for Tijuana television station XETV, Tony Frias; and Frias antenna was extensively discussed in a three part article appearing in the January-March (1978) issues of **CATJ.** But more than there being doubting Thomases, Oliver was this time too late with the right idea. Prior to 1976 or so, if Oliver or anyone else had come along with this antenna, the largest consumers of larger-than-life television antennas, the cable TV system operators of North America, would have beat a golden pathway to the inventor's door. But alas, in the 1976 to 1978 period the larger-than-life antenna people, the cable operators, had begun to discover a new form of television signal delivery; the satellite. And as more and more services came on the satellite, fewer and fewer cable systems had a need, or a desire to battle for, distant over-the-horizon VHF or UHF terrestrial signals. Oliver was not unaware of all of this happening, nor was he particularly concerned that nobody beat a golden pathway to his door asking for the secrets to his Spherical VHF/UHF antenna system. Oliver too was looking skyward.

By late in 1978 Oliver Swan had decided that the right approach to satellite TV reception was the same basic Spherical antenna he had created for VHF and UHF TV. Only some changes would be required. First of all, the tolerances at 4 GHz were considerably tighter than at 200 (plus or minus 100) MHz. Where a two inch accuracy tolerance was acceptable at TV channel 13, a 0.050 inch accuracy tolerance was widely acclaimed as 'maximum-allowable' at 4 GHz. That didn't bother Oliver. **"It's all mechanics. A person just has to build to tighter specifications; that's all!"** he would note.



VHF TV SPHERICAL - installed in Arizona for one of Swan's many very small cable TV systems utilized 40 foot tall steel pipe supports and 2 inch chicken wire mesh. Basis for TVRO Spherical started here in 1976.

By February of 1979 Oliver Swan had a framework constructed; a huge 20 foot by 20 foot affair fabricated out of steel pipe and lots of cremated welding rods. A photo of the super structure appeared on page 59 of the March 1979 **CATJ.** We took that photo while visiting Oliver for our **Satellite Magazine** videotaping. Oliver seemed, at the time, not terribly concerned about making the Spherical **Reflector work 'to tolerance' although he did have certain conceptions about its final form which subsequently changed. "The surface will be thin aluminum sheet"** he noted at the time **"laid down in strips from top to bottom".** That was before he did some checking with people like Taylor Howard who had (it turned out) been using a screen mesh reflector for his 15 foot parabolic terminal since 1976.

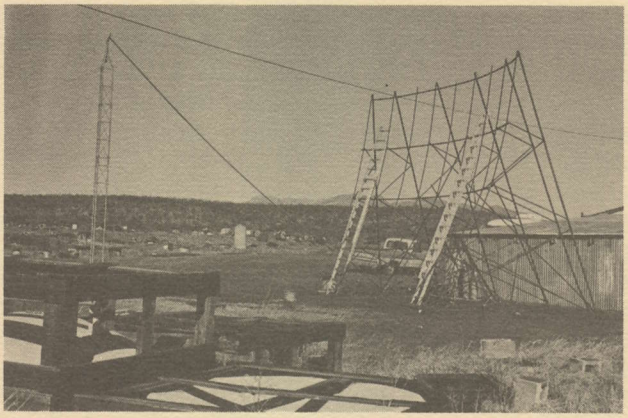
But the feed . . . that was going to be tough. A number of text books revealed that you probably could not maintain phase angle over such a (comparatively speaking) wide antenna surface.

Several people Oliver did **not** solicit advice from told him (none the less) **"at best you will end up seeing perhaps six or seven feet of the reflector and no more. So why bother to build a bigger one?"** Oliver had heard that type of story before. Everyone who saw his early efforts at a 'broad-banded yagi' scoffed at the concept he had. **"A yagi is just naturally a narrow band device and you can't stack dipoles along a boom and expect to maintain phase purity. The think will end up as a giant creator of ghosts!"** one highly respected antenna engineer of that era advised Oliver. **"If you are going to stretch all of that chicken wire over those frames at least build a parabolic reflector; we know they work"** suggested another antenna person nearly 25 years after Oliver invented the log periodic.

Oliver has an unusual trait. He seldom gets angry when he knows the person offering the advice is well meaning. He simply shrugs it off, goes to his shop and closes the door. Oliver is most at home with a metal saw, a pair of tin snips, a drill press and a stack of metal. He loses himself for days in his galvanized metal shop building just adjacent to his home. He lost himself there for several weeks last spring, drawing lines on scrap pieces of cardboard and running his calculator overtime. When he emerged from the shop after a marathon session of thinking and tinkering and drawing late this past spring, he knew he had perhaps approached the reflector surface incorrectly. There it was . . . the same huge skeleton of February, rusting in the hot Arizona desert sun, looking for the world like a victim of Lady Bird Johnson's war-on-billboard signs.

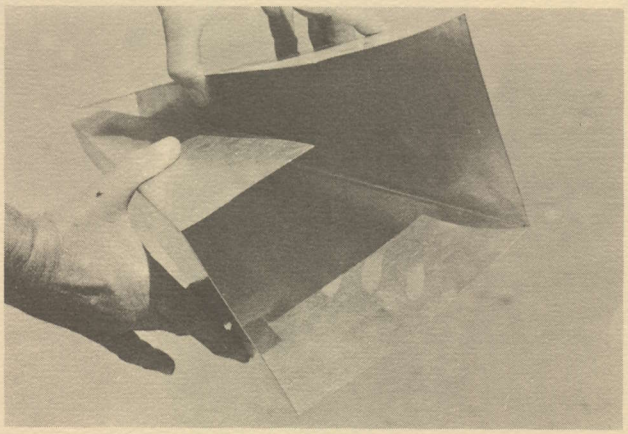
By early in June the big monster **was surfaced;** With common aluminum window screening. And a second version, smaller in size, was taking shape along side of the monster. It was ten foot across, and resembled a bed spring that had supported an elephant in the middle; concave as it were. Both went into operation at more or less the same time.

The feedhorn was the principal problem. Designing **a reflector** that could be duplicated inexpensively was one thing. Designing a reflector surface that could be knocked down for easy shipment was an even smaller problem. But the feed horn; someone had told Oliver that the world's biggest Spherical antenna, the Arecibo (Puerto Rico) radio astronomy 'dish' had limped along with an inefficient feed for nearly eight years because the world's best antenna experts had not been able to resolve the question of how do you properly illuminate such a massive structure and not end up wasting 50% or so of the reflector surface. Taylor Howard and others supplied Oliver with exhaustive reference materials from the Arecibo experiment. And he got plenty of advice too. In the end Oliver piled the reference materials in a corner where today they gather dust and he went back into the shop where his favorite tools resided. Around eight cut and try feed horns later he had it whipped. The ten foot Spherical was producing pictures in a 33 to 34 dBw EIRP contour which had either no sparklies at all, or the faintest hint of sparklies on just a transponder or two. Word spread fast and the doubting Thomases re-surfaced all over again. Nobody could sit out in the desert of south-eastern Arizona and create a ten foot aperture TVRO antenna that would simultaneously receive noise free pictures from up to nine different satellites. It just wasn't possible!



FEBRUARY 1979 STEEL FRAME - a 20 foot by 20 foot monster was Swan's first effort at TVRO Spherical antenna.

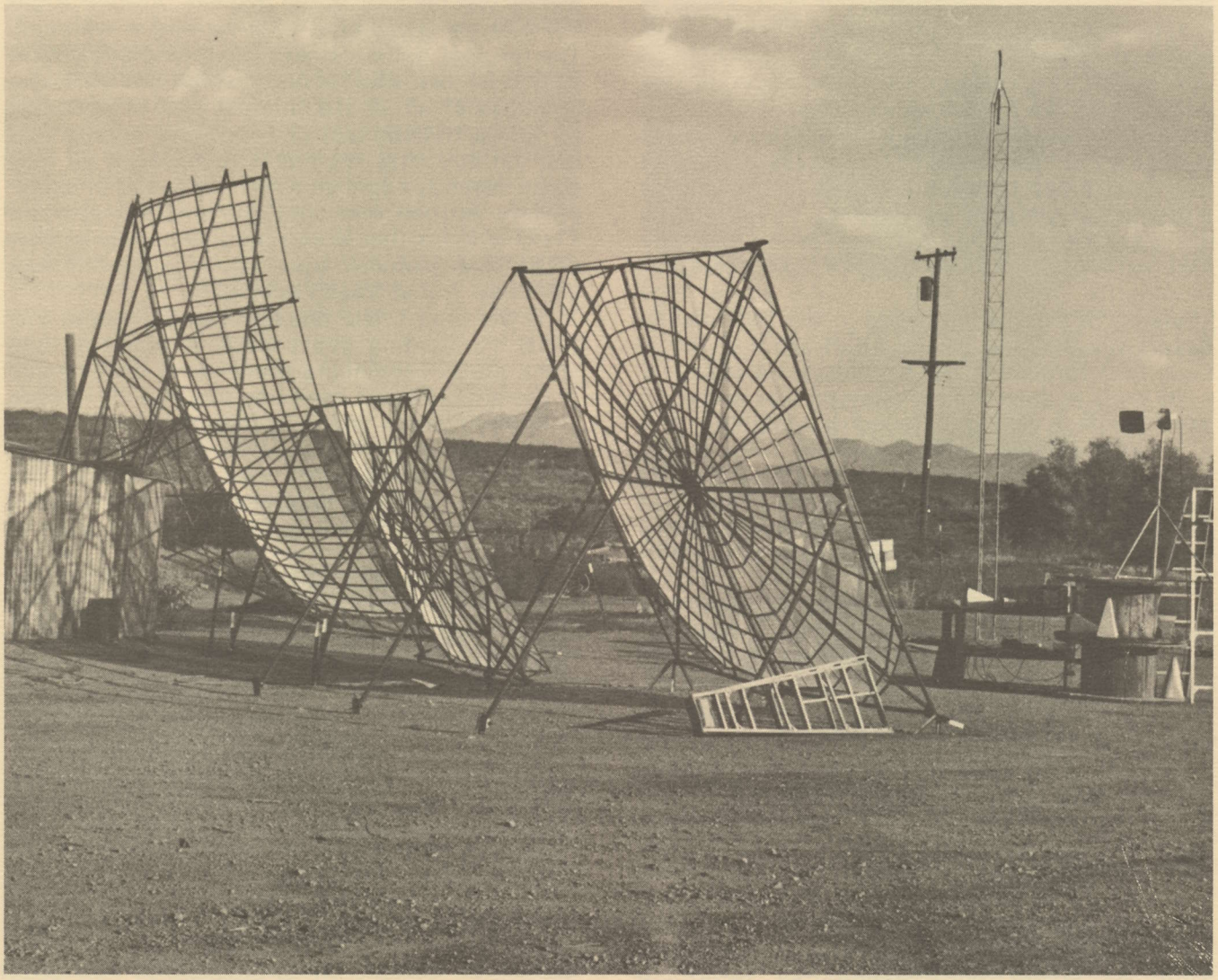
By the time Oliver reached the Oklahoma City SPTS '79 meeting this past mid-August he had some pretty convincing proof. A 16 foot version of the antenna had been shipped to a TV station in El Paso where tests were conducted on a one on one basis against a name brand 4.57 meter parabolic antenna. Oliver won by around 1.5 dB. But anyone who was **determined** to be a doubting Thomas wasn't listening. **They** had not been to



TYPICALLY SWAN - feed horn for TVRO Spherical is fabricated from galvanized sheet material, formed on bench vice and soldered together!

El Paso and **they** had not seen it work. But the SPTS release of the antenna did attract some positive interest as well. A pair of well known cable television operators, also from west Texas, arranged for Oliver to transport another 16 foot version to a lonely country site where representatives of PBS, the National Cable Television Association, and numerous would-be manufacturers saw it perform. Oliver in his usual fashion arranged to videotape the whole demonstration; starting with the arrival on the site of the pick up truck and ending with three separate feed horns positioned out in front of the Spherical reflector each picking off a multitude of transponders from a different satellite. (Segments of that Swan created tape are included, by the way, in the Swan Spherical Antenna videotapes available from STT.)

From that demonstration word again spread fast. At a September meeting of the Board of Directors of the cable association, men who would hardly pay attention to an antenna unless it arose in the night and bit them severely, spent hours detracting from their important industry business to discuss the amazing demonstration that all had by then heard about. The cable industry, in particular, had a 'special interest' in **any antenna** that could receive signals from **two or more** satellites, simultaneously, without being re-positioned. For the cable industry will, come this next January or so, be facing a twin-satellite situation wherein cable programming will be available simultaneously on both RCA SATCOM FI and the yet to be launched FIII. With the uncertainty that continues over which of the existing popular satellite channels will be on which bird, as well as which new service will be available on which bird . . . well, it was almost

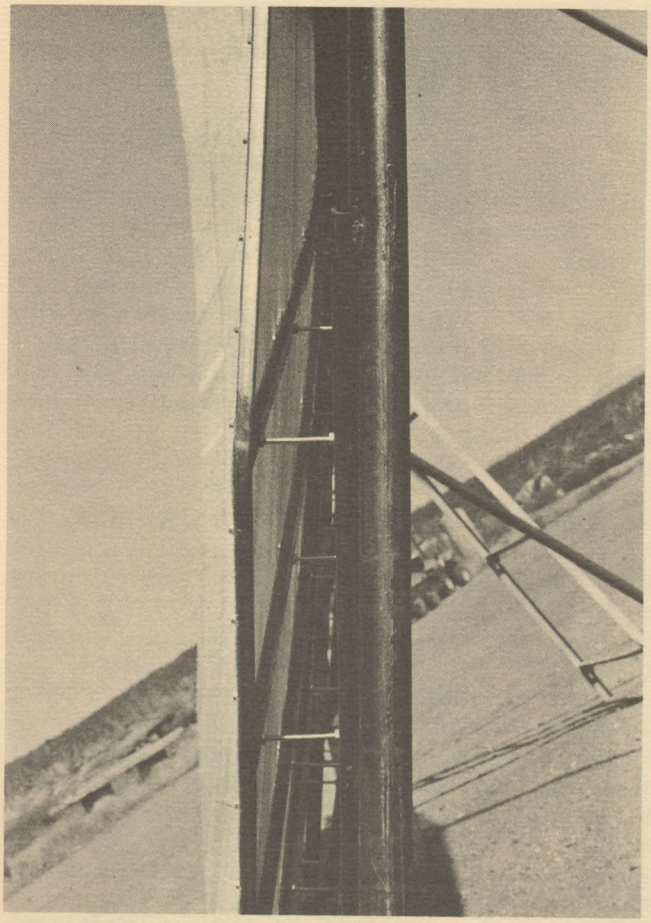


THREE IN A ROW - massive 19-20 footer [far left], backyard style 10 footer [center] and CATV type 14 footer [right] are lined up at Swan's Arizona test range.

certain that every cable system in the country would be seriously looking at **two separate parabolic antenna systems** before far into 1980. Oliver Swan had the answer. One antenna, capable of receiving signals from two birds at one time, or three or as many as could be crammed into say 40 degrees of orbit arc.

Oliver in the meantime was not sitting in Cochise County weaving baskets. His brother Henry, with an accounting background, began to run some numbers. The antenna's costs depended upon how you set up to produce it. Both Oliver and Henry knew that the antenna was not going to be produced using 1.25 inch 'gas' pipe and window screening. At least not commercially (although dozens were already under construction by mid-September as hundreds of people were introduced to the design through STT's **'Swan Spherical TVRO Antenna Manual'**). Henry and Oliver worked out a design for a folded/folded rib constructed from a sheet metal product. This provided light weight ribs for the concave surface, but strong enough to withstand winters that never arrived in the Bisbee area. Henry returned to the Stockton area late in August to set about creating a manufacturing facility for the antennas. With the limited internally generated capital Henry figured they could initially turn out five antennas per week. Oliver meanwhile was cross checking himself on the feed horn design and answering the burgeoning number of telephone calls and letters and then finally personal visits from people who had heard about the incredible antenna. One of those visitors turned out to be Clifton Gardiner of Gardiner Communications Corporation in Houston.

"I don't know what I really expected to find when I got to Oliver's place" notes Gardiner, **"but my engineering advisors had warned me to be prepared to find a bunch of chicken wire stapled up on fence posts and very snowy, degraded pictures".** Gardiner's engineers were of the doubting Thomas variety. Cliff, however, has always had a mind of his own and so he made the trek to Bisbee. **"A person really has to want to see Oliver to make that trip!"** smiles Cliff. **"It's quite a hike from Tucson".** Gardiner was not prepared for what he found. Oliver ran the Hughes loaner receiver STT obtained for him through the paces on SATCOM FI on a 14 foot version of the antenna. **"I kept looking for sparklies or some sign of degradation. I'd scratch my head and look at the pictures on the professional monitor I brought with me, then I'd walk over and run my hand down the aluminum window screening. And then I'd just shake my head in dis-belief"** recalls Gardiner. But Oliver was not through. He trotted out additional feedhorns and additional LNAs and proceeded to line them up for Cliff. **"one for WESTAR II, another for WESTAR I and then for good measure we looked at ANIK-B"** smiles Oliver. **"In all of the earth station installations I've seen, and our firm has been responsible for perhaps 300 of them to date, I can honestly say I've never seen better pictures"** notes Gardiner. **"Seeing ANIK way down here just a half mile from the Mexican border on a 14 foot antenna surfaced with aluminum window screen is something I will never forget"** he adds.



BEEFY CONSTRUCTION TECHNIQUES - followed with Spherical for TVRO work. Concave reflective surface is formed with myriad of threaded adjusting rods [10:24 screws].

That was late in September. Gardiner wasn't leaving without an agreement from Oliver but that was no trick; Oliver wanted to give him one anyhow. **"We worked it out where Gardiner will manufacture the antennas for national sale"** notes Gardiner **"and Oliver will be paid a royalty for every antenna we manufacture and sell".** With the cable industry chomping at the bit for an antenna capable of adding a second bird, and Gardiner already well established as a prime supplier of cable industry terminals, the marriage seemed perfect.

Gardiner's agreement with Oliver Swan is the first step in what is now a crash program to put

the Swan Spherical Section (every panel will have a big 'SSS' stamped on it so in the future people can tell 'the original from a copy') into a marketable package. Where Oliver stopped (a completed design, working to or very close to its efficiency capacity) Gardiner's engineers will take over. **"We have to make the antenna look aesthetically nice"** notes Cliff. **"The cable market is a funny market; they want the antenna to look like something straight out of the space age. They are very image conscious and while I have no trouble with gas pipe and aluminum window screen myself I can see that we may have to put as much time and money into making it look 'spacy' as Oliver has put into making it work".** Gardiner is working against a deadline of considerable odds. The next big cable trade show comes up in mid-December in Anaheim, California. With the RCA FIII launch timed for about the same week, and it's operational status to follow within say sixty to ninety additional days, being on hand at Anaheim with a working, saleable, 'aesthetically pleasing' version of the 'SSS' sectioned antenna is important.

Under the terms of the agreement brother Henry, in Stockton, will continue to manufacture a version of the same antenna. **"Henry's agreement with me supercedes the Gardiner agreement"** notes Oliver **"and even if Henry was not my brother, an agreement is an agreement".** Gardiner says he can live with that. **"This antenna is the most exciting thing I have seen in thirty years in the communications business. As good as it is for the cable operators, and their immediate need for two bird reception starting early in 1980, can you imagine how well this antenna is going to function for individual home terminal systems in the years ahead? Oliver has really done something worthwhile here".**

That he has. After more than twenty five years of playing with antennas, Oliver Swan with not formal training and considerable dis-dain for textbook formulas and people who say "you can't do it that way" has at last been recognized for the antenna wizard that a handful of us always knew he was. What other projects does Oliver have in mind, now that he is into the big time?

Well, through this report we have not even eluded to Oliver's talents with a soldering iron, a handful of transistors and other fixed parts. Oliver has had a concept for a truly low cost satellite receiver for some time. He has the same cut and try approach to electronics as he does to antennas. In fact he recently perfected a very innovative signal trap which several of the scrambled TV people have looked at first hand. And part of his arrangement with Gardiner includes his being able to distribute his own antenna (plus Gardiner supplied LNAs and receivers) in the Arizona area. Oliver sees himself installing private TVRO terminals for hundreds of remote Arizonians and even residents of Mexico over the next few years. **"The market here is wide open; and as we get the price down it just gets bigger and bigger and bigger".** What else? Well, there is a project to build a really big Spherical (say a ten meter job) for **transmit** and receive applications. Then some guy asked about mounting the LNA on a track so he could motor drive it from his easy chair; just one feed horn and LNA you understand, but move it along a model railroad like track to change satellites from the TV set. **"That's a small project; probably have it done in a few hours time"** smiles Oliver.

Is there a message here? There are several. It does not take a degree in antenna design to make your mark in the world. But it does take dedication and lots of hard work. Oliver's made it three times running, but it took the combination of the right design **and** the right market environment to really put him into the limelight. Anyone with an idea, willing to spend some time working at it, oblivious to the sneers of those who "know it won't work" can do the same thing. Whether it be in the receiver field, the LNA field, or even in the antenna field. Oliver Swan is on the program at SPTS '80 in Miami this coming February. And one of his 'SSS' stamped antennas will be on hand, with Oliver, for you to see. And if you can't wait that long? Well, the Swan Spherical TVRO Antenna Manual is available now from STT (see inside front cover of this issue of CSD) and with that manual in hand, you too can build a Spherical TVRO antenna!

THIS MONTH'S PROGRAMMING HIGHLIGHTS

CBC Northern Service (English language) was originally available on ANIK III parked at 114 degrees west. More recently, CBC Northern Service has appeared on the 4 GHz downlink portion of the 1979 activated ANIK-B satellite; a dual band satellite with downlinks in both the 4 GHz and 12 GHz bands, at 109 degrees west.

Three video services are offered on ANIK; the French language service originating in Montreal appears on transponder 8 (3980 to 4020 MHz). This is designated the **'A'** pro-

CBC NORTHERN TELEVISION WEEK

CHANNEL C PROGRAM SCHEDULE

YUKON AND MOUNTAIN TIME

Y.T.	M.T.	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
6:00	8:00							
6:30	8:30							
7:00	9:00							
7:30	9:30							SIGN ON
8:00	10:00						[illegible]	GETTING I TOGETHER*
							FANGFACE*	EMERGENCY PLUS 4 *
8:30	10:30	sign on						SEAGULL*
8:45	10:45	FRIENDLY GIANT					CLUE CLUB*	SAM
9:00	11:00	ALBERTA* SCHOOLS	CANADIAN SCHOOLS	SPECIAL: WHY SHOULD I CARE	ALBERTA SCHOOLS*	CANADIAN SCHOOLS	Tell me/ Barbapapa Jeremy *	MEETING
9:30	11:30	MR. DRESSUP			MR. DRESSUP		SEARCH & RESCUE	PLACE
10:00	12:00	SESAME STREET					WOW	CFL
10:30	12:30							FOOTBALL
11:00	1:00	DR. DOO-* LITTLE PU MTL	WICKIE* PU MTL	ENFANTS DU 47A PU MTL	MME&SON* FANTOME PU MTL	TAQRAVUT* TUKTU*	SPORTS	CALGARY AT TORONTO
11:15	1:15							
11:30	1:30	WICKS					STREET WEEKEND	
12:00	2:00	TODAY, FROM...						
12:30	2:30							
1:00	3:00	EDGE OF NIGHT						WILD KINGDOM V
1:30	3:30	TAKE THIRTY						ARTS LIB EX VCR*
2:00	4:00	BOB MCLEAN SHOW					YOU CAN DO IT	ONE OF A KIND. VCR
2:30	4:30						NATIONAL GEOGRAPHIC	REACH FOR THE TOP VCR
3:00	5:00	BEYOND REASON					PRESENTS*	COUNTRY CANADA
3:30	5:30	ALL IN THE FAMILY					CBC SAT. EVE. NEWS	HYMN SING
4:00	6:00	THE BEACHCOMBERS					NHL HOCKEY	NEWS
4:30	6:30	MARY TYLER MOORE SHOW					NHL HOCKEY	THIS WEEK IN PARLIAMENT
5:00	7:00	CBC EVENING NEWS					...CONT	DISNEYS WONDERFUL WORLD
5:30	7:30	(EX:VANCOUVER)						
6:00	8:00	IYC SPECIAL: WHY SHOULD I CARE	PEOPLE OF THE SEAL PART ONE *	HAPPY DAYS				BEACHCOMBE
6:30	8:30			FOREST* SPIRITS	TAQRAVUT* TUKTU*	FLAPPERS		MORK AND MINDY
6:45	8:45							
7:00	9:00	THE WHITE SHADOW	HAPPY DAYS	NATURE OF THINGS WITH DAVID SUZUKI	MUPPET SHOW	ARCHIE BUNKERS PLACE	THE DEVIL AND DANIEL MOUSE	SUPER SPECIAL ANDRE GAGNON
7:30	9:30		THE RAES		KING OF KENSINGTON	FRONT PAGE CHALLENGE	WORKING STIFFS	
8:00	10:00	M*A*S*H	THREE'S COMPANY	THE MUSIC OF MAN: "Quiver of Life:	BARNEY MILLER	SPECIAL:	GREAT	A GIFT
8:30	10:30	W.K.R.P.	THE FIFTH ESTATE		CITIES: "George Plimpton's New York"	JAMES BAY	MOVIES EX VCR	TO LAST
9:00	11:00	NEWS-MAGAZINE		SPECTRUM:		DALLAS		MARKET-PLACE
9:30	11:30	WATSON REPORT	MAN ALIVE	"Mad Shadows"	THE * NORTHERNERS			OMBUDS-MAN
10:00	12:00	THE NATIONAL					N.NOTES*	NAT.BUS.
10:15	12:15						NIGHT FINAL	
10:22	12:22						* (EX:VANCOUVER)	
10:27	12:27							
10:30	12:30	NIGHT FINAL (EX:EDMONTON) *						
10:45	12:45	THE TWO RONNIES	CHARLIE'S ANGELS*	THE ALPHA CHRONICLES *	SIDE-STREET	A NICE SHOW LIKE YOU PU VCR	CBC NORTH LATE MOVIE*	STARDUST THEATRE (EX:VCR)
11:00	1:00	STRUCK BY LIGHTNING						
11:15	1:15							
11:45	1:45	NEW KIND OF FAMILY	SIGN OFF		SIGN OFF			
12:00	2:00					RETURN OF THE SAINT		
12:15	2:15	SIGN OFF		SIGN OFF				SIGN OFF API
12:30	2:30					SIGNOFF		
1:00	3:00							
1:15	3:15							
1:30	3:30							

gram channel and typical programming hours are 0800 to 2300 eastern time. The eastern-Canada English language service appears on transponder 10 (4060 to 4100 MHz) and this is designated at channel **'B'** (shades of Mr. Solo!). The western and northern Canada English language service appears on transponder 12 (4140 to 4180 MHz) and this is designated as channel **'C'**.

This month's programming schedule highlights the current (October) schedule for channel 'C'; YT (far left column) is Yukon time while MT is Mountain zone time. The Programming on channel 'B' generally follows the same program sequence as that shown for channel 'C' but it is shifted in time four hours (i.e. Mary Tyler Moore appears at 1630 hours eastern on channel 'B' and again at 2030 hours eastern (1630 YT) on channel 'C'.

Reception of transponder 'A' (French) is generally sparklie free down to the Mason-Dixon line with a 12 foot antenna and 120 degree LNA from ANIK B while channels 'B' and 'C' run from 1 to 3 dB lower in level depending upon your east-west location.

FLAMES WTBS SCHEDULE

The Atlanta Fames professional hockey team will appear on 'Super 17' in 25 games during the 1979-80 season; as follows:

DAY	DATE	TEAM	EASTERN
Sat	11/3	Pittsburgh Penguins	8:00 PM
Sun	11/11	Boston Bruins	7:00 PM
Thu	11/15	Buffalo Sabres	8:00 PM
Sun	11/18	Washington Caps	7:00 PM
Sun	11/25	Hartford Whalers	7:00 PM
Wed	12/12	Edmonton Oilers	9:30 PM
Sun	1/6	New York Rangers	7:30 PM
Sat	1/12	Boston Bruins	1:30 PM
Mon	1/14	Montreal Canadiens	8:00 PM
Sat	1/19	Los Angeles Kings	11:00 PM
Sat	1/26	Detroit Red Wings	7:30 PM
Wed	1/30	Quebec Nordiques	8:00 PM
Fri	2/8	Edmonton Oilers	9:30 PM
Wed	2/13	Detroit Red Wings	7:30 PM
Sat	2/16	Minnesota North Stars	9:00 PM
Sun	2/17	Chicago Black Hawks	5:00 PM
Fri	3/7	Vancouver Canucks	11:00 PM
Sun	3/9	Winnipeg Jets	3:30 PM
Sun	3/23	Chicago Black Hawks	8:30 PM
Sun	3/30	Philadelphia Flyers	7:00 PM
Wed	4/2	New York Rangers	8:30 PM
Sat	4/5	Washington Caps	7:30 PM

PROGRAMMING PERMISSION & LICENSING

TO SCRAMBLE...

Anyone engaged in common carrier delivery services is uptight these days over the 'market security' of their services. This includes the MDS systems, the satellite delivery systems,

TYPICAL 'SOFT' SCRAMBLING - demonstrated in March of 1979 during the NAB [National Association of Broadcasters] SMARTS feed tests simply removed key sync information from the main carrier and transported it along on an unused [normally audio available] sub-carrier.

HARD SCRAMBLING WITH A TWIST - RCA's two-for-one system sends two descrete sets of video on a single transponder, interleaving lines of video from one and the other to form a double image system. Cost of decoding remains high however since pictures must be put back together at baseband on receive end by 'simulating' alternate missing lines in each picture through 'above and below' comparison.

and a form of non-common carrier service that acts for the world as if it were a common carrier; over-the-air pay television (now operating in Boston, New York/ Newark, Los Angeles, etc.).

All pay programming services have a common problem; their program suppliers. To date the program suppliers are not involved very heavily in the actual distribution of the programming (via satellite, pay-TV or MDS); rather, they are more concerned with turning out the product initially that will sell well. This leaves the burden of the security problem resting squarely on the shoulders of the actual distributor of the product; or the middleman.

There is a rich, not altogether pleasant history in the film product distribution business. The motion picture producers are a strong group politically and they maintain a substantial lobbying operation in the shadow of the nation's Capitol under the name of the Motion Picture Association of America (MPAA). This lobbying group is one of the most influential in Washington and their top banana, a former close associate of Lyndon Johnson during the Johnson era named Jack Valenti, is well paid for his efforts in D.C. In this case, well paid amounts to something in excess of $200,000 per year in salary plus fringes. A not insignificant annual take in the same realm as that received by the President of the United States; only **this president** doesn't have to worry about public opinion polls or negotiating SALT treaties!

In the MPAA mentality there must be laws and rules and regulations to protect **their** product. It was largely the efforts of the MPAA in 1974-5 and 6 that saw the ancient, admittedly outdated 1909 Copyright Law finally get reworked into a new law in 1976. A precedent was established by that 1976 law, largely created and pushed by MPAA; that precedent being that **certain television viewers** would pay a annual fee into something called 'the Copyright pot' for the 'privilege' of watching television. Those certain viewers are those homes connected to the nation's cable TV systems. Under the 1976 law, cable homes are 'taxed' a special fee for watching programs brought into the cable system from 'distant markets'. Cable systems receiving Atlanta's WTBS, for example, can be paying 1% or more of their gross proceeds into the Copyright pot for **that** channel, if they are outside of 'the Atlanta market'.

The 'Copyright pot' is administered by a bureaucracy established in 1976 along with the law and this bureaucracy is headed by something called the Copyright Tribunal. Three appointees with the power to act as 'judges' in copyright disputes sit at the top of this pile. All of the overhead of this tribunal plus the bureaucracy underneath comes out of the 'pot' and what is left over is paid out to owners of copyrights who file elaborate claims against the pot. It is something straight out of 1984 and probably could spawn and grow only in the rich soil of our nation's capitol.

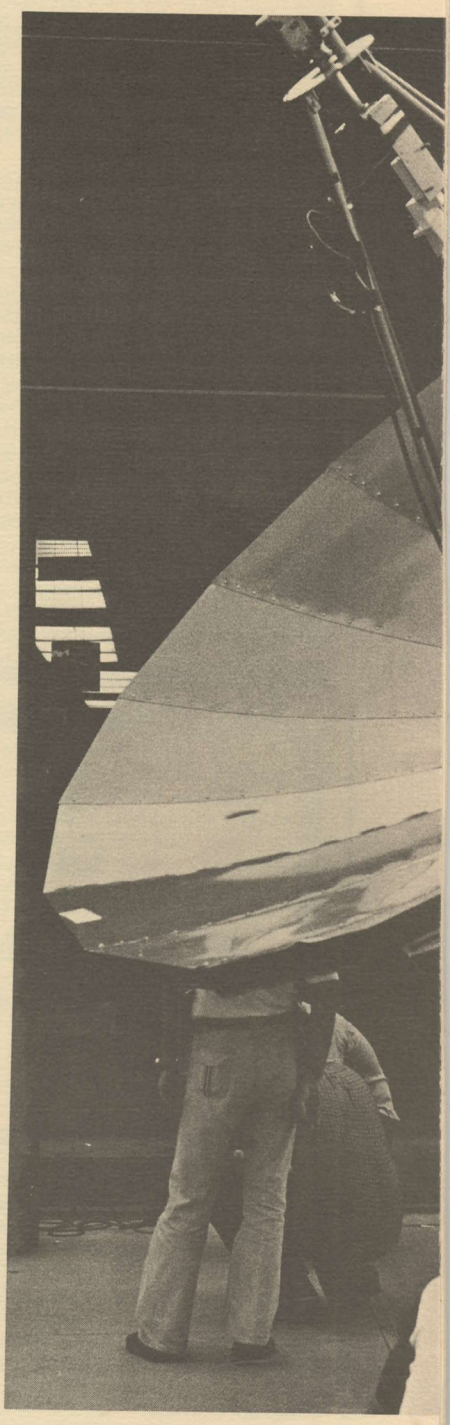
The MPAA has been complaining, virtually from before the ink dried on the 1976 law, that cable systems were getting by 'too cheap'. In the MPAA mentality, TV stations who sell advertising to pay for programming don't pay enough for their programs when cable systems carry the programs to distant areas. The copyright pot is MPAA's answer to all of this and recently the MPAA top exec Valenti has been making noises of getting the annual fees raised to someplace in the 18 to 20 percentile range. That's quite a jump from the 1% region but then at $200K per year Valenti can afford to be bold and daring.

How or what does all of this have to do with satellite signal scrambling? On the surface, not very much. But if you understand the nature of the opponent, what it is he considers 'reasonable' and what he considers unreasonable, you can begin to see how folks like HBO, SHOWTIME, STAR CHANNEL et al who **depend upon** the MPAA member firms for their satellite programming fare might be quick to jump when the movie rights owners say 'jump'.

And they have said jump. HBO et al have been told, in no uncertain terms, that if the satellite programmers don't take steps to insure the 'security' of the movie products while that product is temporarily in their hands for distribution, the product is going to either (1) get very expensive to include the costs of what MPAA member firms estimate may be the illegal (as in unauthorized) reception of these movies, or, (2) become impossible to get. This makes HBO (et al) very nervous. They don't want to be charged extra fees for viewers they don't have any control over. And they certainly don't want to lose access to the movies either. As has been pointed out, where would HBO be tomorrow if the movie people cut them off from product tonight? It's kind of tough collecting $9 a month for a color bar pattern.

So HBO came along last summer and announced to its industry that it was willing to 'reward' some fortunate firm or individual who could design a 'foolproof security system' (which means a scrambling system), bring it to them, and license them for its use (or sell it to HBO). This was probably a bit of grand press-agentry designed by and large to assure the MPAA member firms that they (HBO) were going to do something positive about this 'security threat'. But even

PARAFRAME



MOST-ADMIRED AT SPTS '79 was the PARAFRAME ET/3.66 (12-foot) TVRO antenna. Those who saw us go "cherry-picking" on Day Two won't soon forget the fine reception we got from ANIK-B, while using a 150°K LNA. That's big performance and if you were there YOU SAW IT! For reception photos and product information, write or phone "Mr. Paraframe," Jim Vines.

Paraframe, Inc.
1000 Sunset Drive West
P. O. Box 423
Monee, Illinois 60449

Phone 312/534-7435

through the grand standing associated with the announcement one could none the less detect a tone of sincerity. Remember how much color bars are worth.

HBO, as the leader in the programming-via-satellite industry,got others thinking along the same lines. Some, such as Southern Satellite Systems who currently bring up WTBS from Atlanta, are closely studying the possibility and even the probability that they too will scramble. To protect their dime or less per month income from cable homes? No, not hardly. Back to the 1976 Copyright law.

Under the law Common Carriers (SSS is one) are **exempt** from paying into this giant Coypright pot as long as they are passing the service on through to someone else who will be or is responsible for the Copyright fees. But what if the person SSS is passing WTBS to is not responsible? Then who pays? SSS thinks that the Copyright Tribunal, given the opportunity to adjudicate the question, might say they are. And if that happened, SSS might be declared (for Copyright purposes if not for FCC purposes) a **non**-Common-Carrier. SSS can't afford that. No Common Carrier could. Scrambling may not be technically smart, but given the uncertainty of the Copyright Tribunal and how they might rule, it may turn out to be financially smart. So SSS (and one pre-supposes other Common Carriers as well) are looking just as hard at scrambling as HBO. For a different but similar reason.

Other satellite programmers without (1)MPAA problems, or (2)Copyright worries are not interested in scrambling. SSS's SPN (Satellite Program Network) is an original-for-satellite TV network. It has no copyright problems, Nickelodeon has a similar status. ESPN has a similar status. The three Christian channels have yet a third but essentially non-copyright status since they create or own most of what they televise. As the program rights owners, they have no third-party Copyright problems.

So much for the cable programmers. What about the non-cable programmers using satellite? RCA proposed to the broadcasters, in their SMARTS program which would place a gratis (RCA supplied) TVRO terminal at every broadcasting station in the country, that all transmissions would be scrambled or encoded. Not because RCA was concerned about illegal or unauthorized use; but more for RCA's convenience in selectively distributing the programming only to those stations that were entitled to receive the broadcasts. RCA characterized its scrambled SMARTS program as a way of insuring accurate **accounting** of the distribution of programming. RCA wasn't suggesting that broadcasters who were not supposed to get a certain transmission would 'steal it'; rather they were saying that by scrambling all transmissions, and only providing decoding data to the stations that were supposed to receive the transmissions, they "wouldn't be bothered" by its presence. A control room engineer is not apt to mis-switch to a scrambled broadcast.

Scrambling is coming. For several reasons. Some of it may be hard scrambling with a constantly changing decoding code. Other is apt to be 'soft' scrambling with a fixed key to unscrambling. Premium programmers such as HBO are apt to go the hard route; less expensive services more concerned about defending themselves before a Tribunal or in court are apt to go the 'soft' route. Scrambling will be big technical news in 1980. And the fall out from its adoption will be big software news as well.

COOP'S SATELLITE MAGAZINE SCHEDULE

Coop's SATELLITE MAGAZINE is produced by Satellite Television Technology and airs every Thursday at 12 noon eastern (etc.) on RCA SATCOM FI transponder 21 (vertical). The purpose of the weekly one hour program is to illustrate and demonstrate the latest in satellite and cable technology. Bob Cooper visits with innovators around the countryside, with the assistance of Dana Atchley, III and his mobile production facility bringing to your terminal glimpses of people and equipment that are contributing to this fast moving industry.

Program Content	Program Dates
Dana Atchley hosts with guest Wayne Kines who is involved in design and largest (and longest) rural CATV system in world; Manitoba, Canada.	10-25 and 11-01
Paul Shuch excerpts from SPTS '79 covering superheterodyne downcoversion techniques.	11-03 and 11-15
Paul Shuch excerpts from SPTS '79 covering modular TVRO receiver techniques	11-22 and 11-29
Taylor Howard excerpts from SPTS '79 covering terminal design.	12-06 and 12-13

For regular viewers, the October schedule published in last month's CSD got behind by two weeks due to a snafu at SPN. Hopefully the schedule shown here will be accurate!

PROGRAMMING CORRESPONDENCE

MDS ET AL

Your announcement of SPTS '80/Miami says that you intend to cover the subject of inter-connecting a satellite receive terminal to the local area through 'low power re-broadcasting equipment' or systems. Does this refer to MDS, scrambled UHF/VHF translators (are they legal yet?), 10 GHz relays or a combination of the above; or an entirely new subject? I am considering making just such a move in a small community out west and would like to know which is the most cost effective means of accomplishing it.

Jim Barbre
Baton Rouge, LA 70805

Here in the United States, the only legal way to accomplish through-the-air re-distribution of a TVRO signal is via MDS. Most MDS systems [operating as FCC licensees in the 2.15 GHz region] do not scramble; they use standard NTSC format with AM video and FM audio and 'depend' upon the fact that they are operating on a 'microwave band' for their 'security'. A couple have gone into scrambling in markets such as Houston and Chicago, largely in response to the ready availability of do it yourself [or black market] receiving systems available there. Outside the U.S., Canadian David Brough is transmitting scrambled VHF signals fed alternately by either video-tape or satellite to far northern Canadian communities [for a fee of course]. In the Caribbean, Central and South America, one of the most popular systems is to transmit the video/audio signals back out in a portion of the UHF band (typically below channel 14 at 476 MHz but above 400 MHz) **where a standard UHF TV tuner cannot pick it up, and then sell or rent or lease down converters to the customers [sort of a lower frequency MDS approach]. Bob Behar at A-B Electronics** (1783 West 32nd Place, Hialeah, FL 33012) **is the U.S. expert on the 'low frequency MDS' approach; but understand it is not licenseable in the U.S. because there are no frequency allocations to support it.**

AUSTRIAN TV DIRECT?

I lived in Europe for several years and I would greatly appreciate being able to pick up German and Austrian TV programs. Have you heard of anyone in the states who has picked up European TV relayed by satellite?

J. Rozenbergs
Roanoke, VA 24019

Those people familiar with the U.S. and Canadian DOMSAT [domestic satellite] system[s] often have the mis-conception that international satellites are simply more of the same good stuff; except in a foreign language. At the moment this is not the case. INTELSAT birds (see your handy dandy 'Worldwide Communications Satellites Wallchart available from STT for $10 per copy) **are programmed with two types of television material. Some of the African and middle eastern countries [but not Germany nor Austria in either case] lease space or transponder time to relay internal to their country television from typically their capital to one or more outlying regions where regular VHF or UHF TV transmitters rebroadcast the programming over a typical terrestrial coverage area. These INTELSAT relayed transmissions more or less fit our DOMSAT operating modes in that the programs are regularly scheduled, and the programming runs sequentially through the normal broadcast day. However, most video on INTELSAT is more akin to the WESTAR II or SATCOM FII video in that only parts of programs [as fed back to network headquarters] or single programs are relayed. They run through the satellite[s] at a time that suits all parties involved, seldom when they are being shown simultaneously via terrestrial rebroadcast stations. Undoubtedly from time to time portions of German or Austrian TV programs are so relayed [the INTELSAT system merely serves as a relay system] but to be able to sit down and watch the TV you are after on a regular,** scheduled basis **is not possible. The Germans do expect to launch in the 1982-83 period a DOMSAT of their own which will function as our FI and ANIK birds function; relaying a** full **broadcast day. However, this will be in the 11/12 GHz downlink region using carefully shaped antenna patterns designed to cover** only **a small portion of Europe and even if the 11/12 GHz bird was to be positioned on the geostationary orbit belt so that you would have above-the-horizon visibility of bird, you would here in the states be so far down on the antenna pattern that the chances of being able to receive it would be slim at best.**

FCC DISMAY

In Bob Cooper's 'New Frontier' column in the October (1979) QST, he states that the FCC is now 'routinely granting private (as in noncommercial) home satellite earth terminal licenses'. Since I do not want to pay a visit to a federal courtroom, I decided to call our local FCC district office here in Seattle. The engineer-in-charge informed me that the only application forms known to him were for commercial installations and are very lengthy and detailed. This did not sound like the licensing that Coop made reference to. I then talked with Bill Lombardi at the Common Carrier Bureau at the FCC. He stated that the FCC does not have any sort of application form for the 'backyard TVRO terminal'. I would greatly appreciate any further information on this matter.

Craig Jobest
Marysville, WA 98270

Sometimes these questions are just a matter of timing. The district FCC offices are typically the last to know what has been approved [or dis-approved] in Washington. That is the nature of the overwhelming amount of paperwork created by the FCC in D.C.; getting that data to 24 or so field offices in a format that can be quickly digested by over burdened field engineers is difficult at best. The FCC is of course 'routinely granting' private (as opposed to commercial) **terminal licenses; at the time you called Bill Lombardi the only way they**

were doing that was via the commercial licensing route. The approach Coop took nearly two years ago was to obtain an experimental or developmental license under subpart E, section 25.390 of the rules. Licensed as WF-92, Coop has had to battle constantly to hold onto that license in the face of opposition from all sorts of groups intent on landing him in a federal courthouse! Under the FCC's deregulation policy (which hopefully we are announcing in this issue) **a clear cut procedure for 'backyard TVRO terminals' is evolving.**

COMING TO VISIT

I am so turned on by the whole concept of satellite television that I can hardly contain myself. Unfortunately I spend six months or so a year on an oil rig off the coast of Brazil, with alternate periods of Brazil and then being home in Texas. The Howard, Coleman and Swan manuals plus CSD help me keep up the interest while off the Brazilian coast but when I get back from this work period I intend to come to Oklahoma City to see you all!

Jimmy Hale
Daisetta, TX 77533

This might be a good spot to discourage dropins at the Coopers. We love all of the loyal satellite TV fans and sincerely appreciate the support we have received in getting this new industry off the ground. With the explosive growth however has come 20 hour work days and a barrage of telephone calls and mail that is increasing at an expontential rate. Better you should come to an SPTS gathering where you'll have an unfettered opportunity to sit down and visit with the real pioneers in this business like Shuch, Howard, Coleman and Swan [to name four that pop to mind].

TAPING MOVIES

In light of the recent California court decision wherein it was found that SONY and other defendents were not guilty of violating U.S. Copyright laws by allowing or encouraging or engaging in the videotaping in one's home of programming broadcast over television, I don't understand how everyone can continue to be uptight over home reception of satellite signals! I don't think that the FCC's section 605 would stand the test of a court case. If the FCC thinks they could make this stick, why don't they go after the Russians who are monitoring our common carrier transmissions at embassies and in the sky all over North America? It appears to me that the 'limited access' broadcasting people (MDS and STV) have gotten themselves into a bind; they are a victim of their own popularity. My own feeling is that as long as people build their own terminals and view these transmissions quietly in their own homes there won't be much of a fuss created. I would expect the commercial organizations to 'write off' the extremely small number of people engaged in this sort of thing. However I would expect any efforts to sell the services to others outside the privacy of the home to be quashed very quickly. The only real solution to all of this is for the whole transmission system to switch to cable where wiretapping laws would preclude unauthorized access!

Malcolm Crawford
Lexington, MA 02173

Readers should not confuse the California SONY/ Disney-MCA court decision with the question of common carrier viewing. The California court did not address this issue at all, but it did make several observations about even sharing videotapes made in the privacy of your home with others. See COOP's COMMENT ON PROGRAMMING in this issue of CSD.

SLEEPLESS NIGHTS

I am a little late in writing this letter to thank you for the outstanding SPTS sessions in Oklahoma City. The one thing that I would strongly recommend for all future meetings that SPTS will have is to retain the ability to videotape all of the sessions as you did in Oklahoma City. This, as far as I am concerned, made the trip and expense worthwhile. As I am

sure you realize, there was simply not enough room in the Paul Shuch sessions for all of us to attend and the videotape replays made a big difference. At the present time I have located a ten foot parabolic antenna and I have designed and built a polar mount. Anyone who would like to see it (constructed from common 3.5 inch water pipe) is welcome to do so. Since I read your first article on TVROs I have spent many sleepless nights. I am not sure whether I should cuss you or praise you. When I get my system totally up and operating I'll let you know which it turned out to be!

Gay M. Hamilton
17381 Roseleaf Ave.
Tustin, CA 92680

Videotaping in Miami is going to be a bear; but we have a positive attitude at the moment and are working on it. We are in a commercial convention center at the Bayfront Park facility in Miami, and unlike the fantastic facility in Oklahoma City at South Oklahoma City Junior College where the whole place was 'wired for TV' we are going to have to figure out a way to establish a distribution system for those who will (IF we work it out) be able to plug in for dubbing the proceedings. If you think you have sleepless nights now Gay, wait until the terminal is operational! Super-17 never signs off and by the time dawn is breaking in L.A. the eastern based premium service channels such as STAR CHANNEL are starting their 9 AM [in the east] features again.

BIRD OPERATIONAL NOTES

Direct to home broadcasting satellites in 4 GHz [C] band may not be dead issue yet; although outcome of **WARC** talks still underway will have plenty to say about ultimate configuration. **RCA** Prexy Edgar Smith has told Geneva delegates his company would support system consisting of three clusters of 4 GHz birds designed to provide **C** band video services to homes; clusters proposed would service (1) North and South America, (2) The Pacific plus Asia, and, (3) Europe, Africa and middle east.

INTELSAT, meanwhile, has announced it will make "extra" transponder capacity on new **V** birds on both **C** and **Ku** bands available for "domestic" systems. Transponders to be available will go for **$1M** per year (comparable to **U.S.** domestic bird rates) but in Global beam configuration which is where rub begins. Global provides 22 dBw over 40% of earth's surface, wide coverage but levels 10 to 15 dB below domestic birds now operating (in C band). **INTELSAT** already has long list of domestic (intra-country) users including: Algeria, Brazil, Chile, Columbia, France, India, Malaysia, Nigeria, Oman, Peru, Saudi Arabia, Spain, Sudan, Uganda, Zaire. Australia, Egypt and Greenland (fed from Denmark) will also start soon; China has shown big interest. All present users employ big **$2M** terminals (if transmit and receive), typically 15 meter antennas.

National Public Radio (NPR) has begun regular WESTAR I service on transponder 6 to affiliates equipped with 4.5 meter dishes; more than 100 terminals expected to be operational with four channels of eventual service before 1 January. ABC radio network latest to task for domestic bird birds on network via satellite for 1,600 affiliates. Service would be for all four ABC sub-nets, stereo service, although audio may be transmitted in digital format.

Future of Canadian cable systems (which received government permission to use **ANIK** satellites last spring) use of bird continues muddled. Latest proposal calls for Hamilton, Ontario station **CHCH** to become 'national network feed' for satellite service. Talks now underway.

Controversial COMSAT proposal to fund and operate six transponder, scrambled Ku band domestic service, satellite(s) now scheduled to be formally presented to FCC next February. Opposition to service is mounting.

SBS, tied up in court over operating its own satellite system, has begun tests with fulltime transponder lease from WESTAR. Stations owned by a firm in Poughkeepsie (N.Y.), Los Gatos (Ca.) and Raleigh (N.C.) now interconnected.

Good news for Caribbean, northern South America and Central American would-be viewers of domestic (U.S.) birds. More and more video showing up on COMSTAR, especially III at 87 degrees west. Transponders 4,8,12,16,20 and 24 boresighted just SW of Puerto Rico place 32 dBw **or better** signal over all of Cuba, southern Mexico south to northern Columbia and Venezuela and all of central and eastern Caribbean. Recently **CBS**, ABC and NBC programming has been carried near-full-time in this transponder set. Reception tests in Dominican Republic indicate 16 foot antenna with 120 degree LNA produce video 'well above' sparkle level; 120 with 12 foot might still make it.

SIN's GalaVision service for Hispanic speaking peoples was scheduled to begin October 26th sub-letting on transponder 18 from Reuters. Uplink (S/A 10 meter) installed in Hollywood. **Reuter's** digital service on 18, meanwhile, is now officially available to 'private terminal operators'. Price tag of $900 per month (you read right!) will include London Gold Market reports. Oh yes, hardware adaptor will set user back an additional **$5,000.**

Merger of Microdyne and AFC (Antennas For Communications) has a message for private terminal users. New firm will be able to supply everything but LNAs from own facilities and Microdyne portion has announced they will place **$10,000** (or under) 'home terminal' into marketplace around 1 March of 1980. Microdyne has been large supplier of commercial (primarily CATV) receivers; AFC has been offering 5 meter fiberglass antennas for CATV market for nearly 18 months and has been primary supplier of 'horn' type antennas for satellite reception since inception of service.

Ted Turner's WTBS has begun deleting some strictly "local" commercials from satellite feed, substituting PSA (public service) announcements. Nobody at FCC seems sure whether this is legal. Turner intends to eventually replace the dumped local (car dealer, carpet dealer, etc.) commercials with national advertising (Coca Cola, etc.) if "test" survives FCC and other flack. **ESPN**, which launched September 7th on transponder 7 with 24 hour per day sports, now claims 4.5 million cable homes serviced. Public service programmer **Appalachian Satellite Network** is beginning 35 hour per week service via SATCOM (I now, III later) with nearly 50 (CATV and other) terminals set up to take service; primarily in Tennessee, Kentucky, West Virginia, North Carolina, Virginia, Maryland and Pennsylvania. **SIN**, to attract cable systems to normal service (not GalaVision) is offering to pay cable systems around $1.00 per 1,000 Hispanic surnamed homes reached per month as part of its 'advertising revenues'. This is the first satellite service video offering to offer to pay cable systems for carrying service even if rate is miniscule.

PBS documentary (8 PM, November 12th) titled "'Real War in Space'" focuses on anti-satellite weaponry.

PROMOTIONAL DATA AVAILABLE

ALTERNATE INFORMATION SOURCES

For those fans of everything written about satellites, here is a current listing of where to go to find our more (or less) than you already know.

73 MAGAZINE - The current (November) issue is **scheduled** to carry a 13 page article written by Coop last spring describing why every ham radio operator should immediately drop everything and start building his own private TVRO. Basic material never goes out of date, some of the recent changes in bird operations are not reflected because of the long lead times between writing and publication. Contains some information not previously published and is therefore worth running down.

RADIO ELECTRONICS - The popular six or seven part series that ran through part-three in the October issue will resume (we are told) with their January (1980) issue. It should run continuous for four more issues, covering the Swan Spherical antenna construction (but certainly not as thoroughly as the Manual!), a hybrid receiver built around the Coleman GaAs-GET LNA, the Coleman VTO-8360 LO source and active mixer, and the Howard 70 MHz i.f. and demod circuits.

ENTREPRENEUR MAGAZINE - A very expensive, how to get wealthy in business for yourself publication, is scheduling an interesting look at the business opportunities presented by the private satellite television explosion in their December 1979 issue. This publication with around 200,000 circulation looks for business and investment opportunities for the 'independent person' and you have to be very clever to even find a copy on a newsstand. Their address is 631 Wilshire Blvd., Santa Monica, CA 90401. Same issue also looks hard at the business opportunities offered by MDS (now that's a sharp magazine that sees the connection between the two!)

PRIME TIME SUNDAY - The exact scheduling of the 9 to 10 minute piece largely 'shot' at SPTS '79 in Oklahoma City remains up in the air but there is a fair chance that it will appear on either Sunday November 25th or Sunday December 2nd. During early November the Prime Time crew will be shooting some 'holes' that appeared in the piece after the editing began including at least one interview with an FCC official in Washington (who can guess what he will say!) and an 'over the shoulder' look at somebody's terminal receiving some of the 'forbidden fruit' that everyone knows (but NBC!) that you are not supposed to watch. If you want to play a guessing game, CSD will think up an appropriate prize for the first person (other than himself and relatives) to correctly identify the mysterious 'over the shoulder' camera subject who takes the NBC crew through a set of forbidden fruit pictures.

SYSTEM PACKAGING NEWS

COOL IT

Those with either a long memory or a significant collection of the 'old' CATJs may recall that in the April 1978 issue a fair amount of space was devoted to the subject of (commercal) LNA design and application. The subject of that particular in-depth look at LNAs was Scientific Communications, Inc.; one of the better quality LNA houses about. And in that report an SCI engineer talked about what might be done to improve the 'noise figure' performance of an LNA by applying cooling to the LNA.

The LNA is temperature sensitive. Or to be more precise, the GaAs-FET (noise figure establishing) transistors in the front end of an LNA are noise contribution dependent upon their operating temperature and the operating temperature of the circuit they are functioning in. Logic has suggested for some years that if you could build a refrigerated container around the LNA and stow the LNA in the container, maintaining a lower ambient temperature inside of the container than one has outside in the air, that the performance of the LNA would improve. The magic numbers are that you can lower the noise temperature (do not confuse **noise temperature** with LNA **operating temperature**) 0.5285 degree(s) Kelvin for every 1 degree C drop in ambient (operating) temperature. Which is another way of saying that the LNA will perform better (i.e. have a lower Kelvin noise temperature) if you would install it at the north pole, than it would have at the equator.

For example...take a standard 120 degree K LNA operating at its spec-rated 77 degree (F) ambient (air) temperature. The noise factor (K) will be the rated 120 degrees. Now cool off the LNA (the whole LNA) to 50 degrees F. The K noise temperature will now be 112 degrees. Lower it to 30 degrees F and the K noise temp will now be 106 degrees. At 10 degrees F the K noise temp will be 100 degrees while at 0 degrees F the K noise temp will have dropped to 97 degrees.

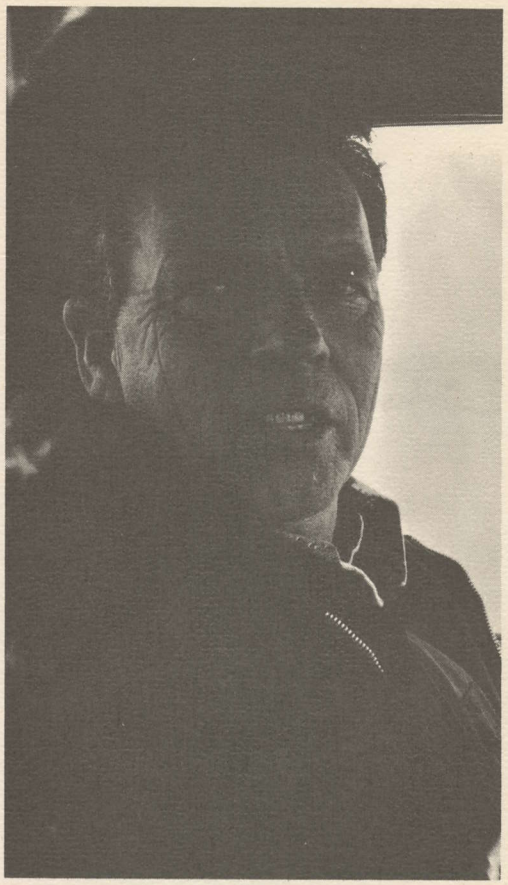
If you could turn a 120 degree rated unit into a 100 degree rated (K noise temp) unit by cooling it (with refrigeration of some sort), and you could cool it for less cost than the price difference between a 120 degree unit (call that $1400) and a 100 degree unit (call that $2800), it might be worth looking into.

Actually a few experimental terminals have built their own cooling systems, but they by and large have been bulky and not easily duplicated systems. Enter now (finally!) a commercial approach to the problem.

B&E Industries (410 Kirby, Garland, Texas 75042; attention Nick Rognlie) has been field testing a series of LNA cooling systems that Steve Vetters of Southern Satellite Systems in Tulsa reports "really helps clear up the sparklies on a 100 degree LNA installed on an 8 foot dish". The device is a housing that fits over the LNA (they have to know the dimensions of your LNA and the mounting system you are using before they can supply a unit). Using a heat pump principle, the system is capable of reducing the effective ambient temperature of the LNA by around 30%. That suggests that on a day when the temperature is 80 degrees F that with the cooling system installed the LNA 'thinks' the temperature is about 56 degrees. And that suggests that a 120 K LNA would become a 113 degree LNA under this circumstance. The cooling system (heat pump) operates on 12 volts and draws between 3 and 4 amps.

OLIVER SWAN–

talks about Spherical TVRO antennas.



Oliver Swan's antenna exploits are legendary. And now he's done it again. A complete series (from ten feet to as large as you want or need!) of 'Spherical' antennas for simultaneous reception from up to 9 geostationary satellites spaced at 4 degree intervals!

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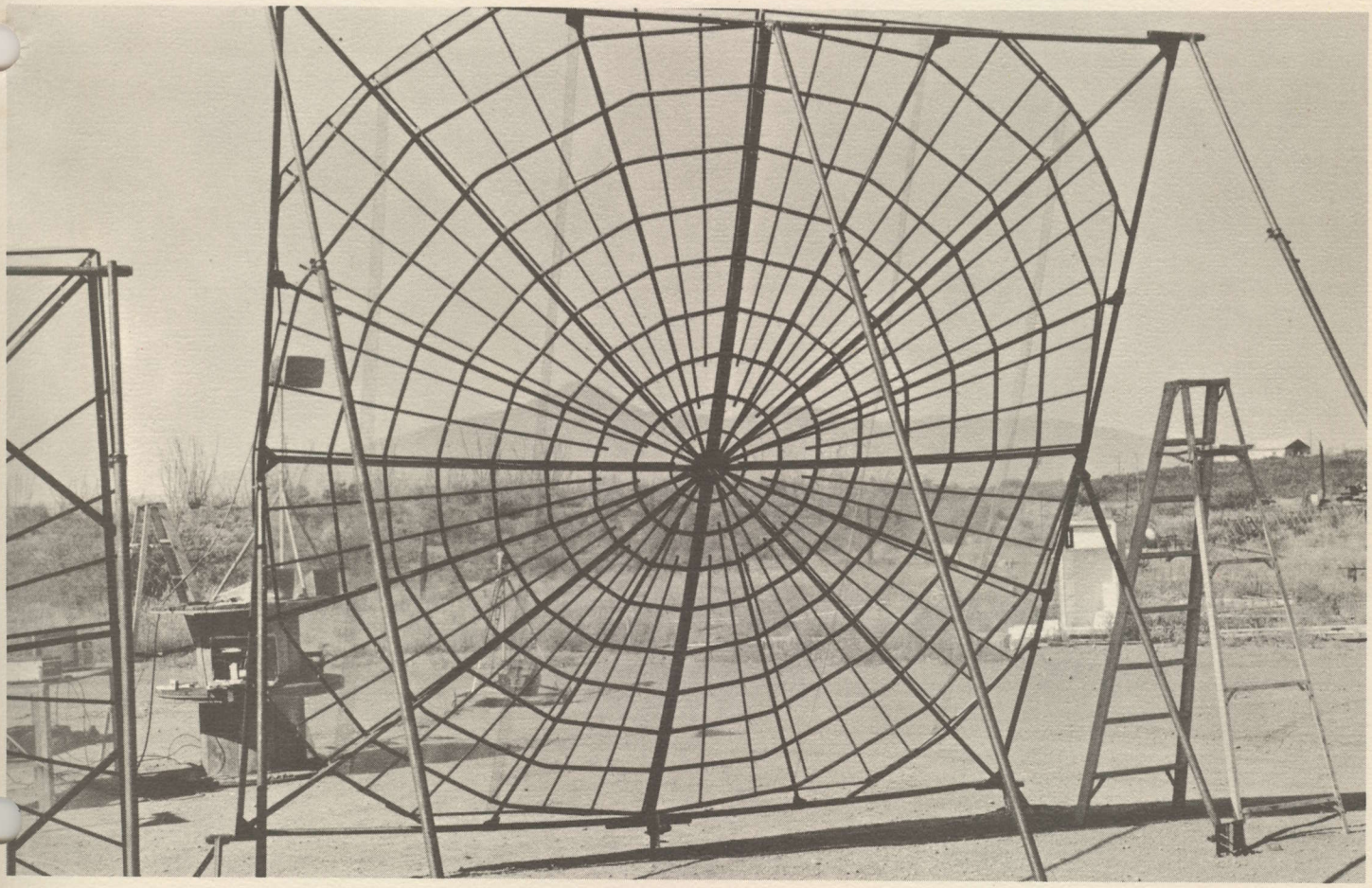

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